VOL. 13

New
Nouveau Brunswick

AGRICULTURE

ADAPTIVE RESEARCH REPORTS

RAPPORTS DE RECHERCHES SUR L'ADAPTATION

with/avec
Cumulative Index Cumulatif
Volumes 1-12 (1979 - 1990)

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Plant Industry Branch
Direction de l'industrie végétale

VOL. 13

1991 ADAPTIVE RESEARCH REPORTS

RAPPORTS DE RECHERCHES SUR L'ADAPTATION 1991

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PLANT INDUSTRY BRANCH
DIRECTION DE L'INDUSTRIE VÉGÉTALE
New Brunswick Department of Agriculture
Ministère de l'Agriculture du Nouveau-Brunswick

ROBERT W. SAINTONGE
Deputy Minister
Sous-ministre

Gérald H. Clavette
Minister of Agriculture
Ministre de l'Agriculture

93-02808/

FOREWORD

This is the thirteenth volume of the Adaptive Research Reports. Each year the Plant Industry Branch publishes the results of various projects conducted by staff members for use by farmers and agrologists.

The reports cover technology transfer activities conducted by the three sections of the Plant Industry Branch: Plant Health, Horticulture, Field Crops. Some papers from the N.B.D.A. Land Resources Branch are also included.

This volume contains the first index covering all volumes of the Adaptive Research Reports since its inception in 1979.

I wish to acknowledge the efforts of staff in conducting the trials and extend thanks to all producers and organizations that cooperated in the projects. A special recognition for clerical support is made to Lina Gardiner.

The financial funding of the cost-shared Canada-New Brunswick-Agri-Food Development Subsidiary Agreement and the Canada-New Brunswick Livestock Feed Development Agreement are acknowledged in supporting many of the projects.

This 1991 volume is brought together and published through very capable efforts of the compiler, Roger Tremblay; and associate compiler, Christopher Maund.

E.T. Pratt
Executive Director

Plant Industry Branch
N.B. Dept. of Agriculture
Fredericton, NB

PRÉFACE

Voici le treizième volume des Rapports de recherches sur l'adaptation. Chaque année, la Direction de l'industrie végétale publie les résultats d'un certain nombre de projets dirigés par son personnel à l'intention des producteurs et des agronomes.

Les présents rapports visent des techniques nouvelles mises au point par trois sections de la Direction de l'industrie végétale : la section phytosanitaire, l'horticulture et les grandes cultures. Certains documents émanant de la Direction des ressources des terres agricoles sont compris également dans ce rapports.

Le présent volume renferme le premier index général de tous les volumes des Rapports de recherches sur l'adaptation publiés depuis 1979.

Je remercie le personnel qui a mené les essais et je remercie aussi les producteurs et les organismes qui ont collaboré à l'élaboration des projets. Je m'en voudrais de ne pas souligner l'apport de Mme Lina Gardiner qui a effectué le travail de bureau.

Je veux également mentionner la contribution financière obtenue en vertu de l'Entente de coopération Canada-Nouveau-Brunswick sur le développement du secteur ago-alimentaire et celle sur le développement des provendes. Ces fonds sont venus apppuyer bon nombre de projets.

Le volume de 1991 a été compilé par M. Roger Tremblay et son adjoint, M. Christopher Maund.

Je les félicite et je les en remercie.

E. T. Pratt
Directeur général de l'Industrie végétale
Ministère de l'Agriculture du Nouveau-Brunswick
Fredericton (Nouveau-Brunswick)

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* Land Resources Branch / Direction des resources des terres agricoles

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GENERAL/GÉNÉRAL

THE 1991 GROWING SEASON

George Read and Marc Robichaud

ABSTRACT: The 1991 Growing season was characterized by a very dry June and July followed by a wet harvest period, this was much the same pattern as was experienced in 1990. Heat units were above normal for the season. Sunshine hours were above normal for the season.

SAISON DE CROISSANCE 1991

George Read et Marc Robichaud

RÉSUMÉ : La saison de croissance 1991 s'est caractérisée par une insuffisance des précipitations en juin et en juillet et un temps très humide pour la récolte tout comme en 1990. On a enregistré des unités thermiques et des heures de temps ensoleillé au-dessus de la normale pour la saison.

INTRODUCTION: Generalizing the weather conditions for the province for an entire season does not explain crop performance on individual farms or even separate regions for the most part. The climate of farms varies significantly from one location to another with such things as frost occurrence, crop development, planting, insect and disease development or harvesting operations. It is therefore necessary to evaluate specific varieties, recommendations and production practices with the most localized or representative information as possible.

Despite these farm scale influences, the overall performance of crops on a provincial scale can often be correlated with major deviations from normal growing season conditions, such as droughts, wet periods, extensive frosts or unusually warm or cold seasons. With these factors recognized, a general summary of the 1991 cropping season weather is presented.

SUMMARY:

May: The month was wet for all areas of the province except the extreme southwest which was approximately 70% of normal rainfall. Heat units were much greater than average ranging from near normal in Woodstock to 200% of normal in Charlo. Most of the province was about ten percent above normal in hours of bright sunshine.

June: The month was dry, very similar to June of 1990. Temperatures were slightly above normal throughout most of the province. Total rainfall for the month varied from 17% of normal in Saint John to 132% of normal in Bathurst. Bathurst however received most of their rain in one large event. This type of distribution is typical of thunderstorm activity that occurs in summer and the quick downpours often lead to excessive runoff and little benefit to dry fields. The sunshine for the month was 25%

above normal with an extra 50 hours.

July: This month presented drought conditions when combined with June's low rainfall. As the map for percent of normal precipitation for June indicates, the totals were generally less than half of normal. Temperatures were from near normal to 123% of normal. Sunshine hours were generally at or above normal for this time of year.

August: The rainfall for the month was very high ranging from 119% to 232 % of normal. Temperatures continued to be near or moderately above normal. Sunshine hours were near normal.

September: The month continued the wet conditions of the previous month making Harvest operations difficult. The poor distribution of water throughout the growing season was reflected in problems for several crops. Temperatures were above normal for September and the total growing degree days for the season were approximately 5 to 10% above the long term average.

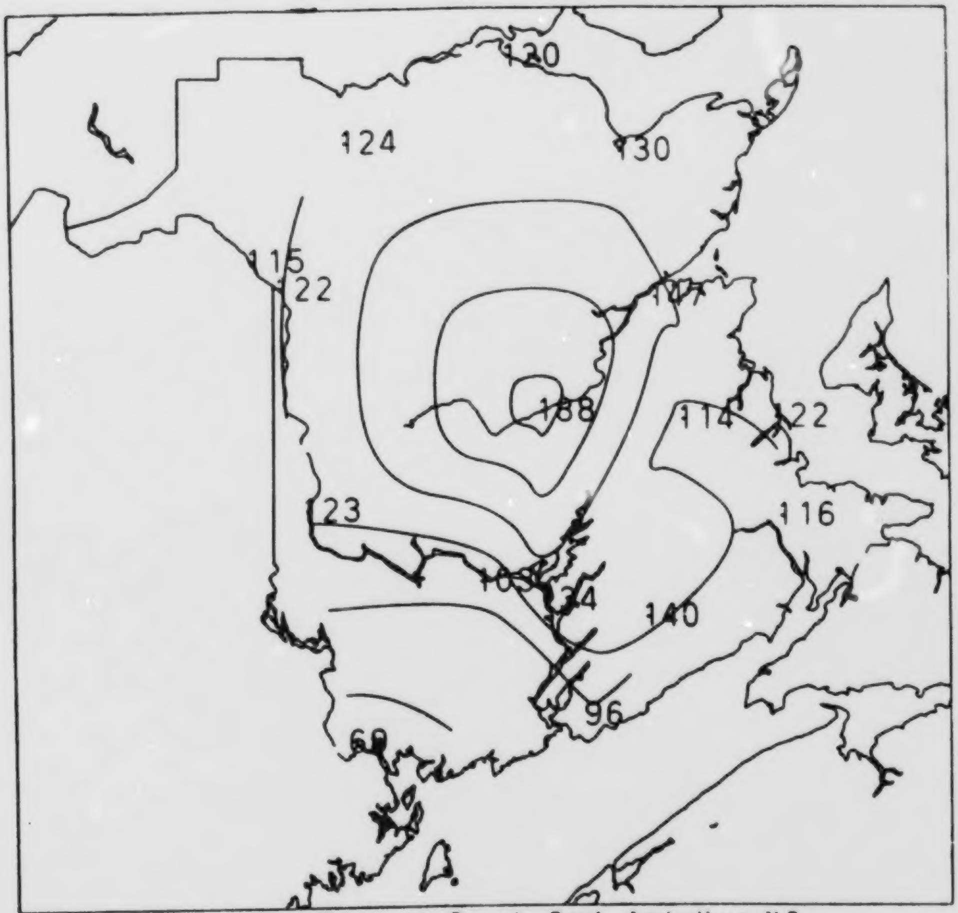
The month of October was wet resulting in poor harvesting conditions for potatoes.

MAPS: The following maps, were prepared by the New Brunswick Department of Agriculture using point data courtesy of Environment Canada. Precipitation and growing degree days maps (GDD) as a percent of normal are presented for the months May, June, July, August, and September. Graphs of weekly rainfall and monthly sunshine hours are given for selected sites. Days of measurable precipitation are also included. The results are based on unverified reports which will be quality controlled at a later date.

ACKNOWLEDGEMENTS: The authors would like to thank Graham Rankine for his assistance in mapping the climate parameters using a digital terrain model.

FIGURE 1:

PERCENT OF NORMAL PRECIPITATION MAY 1991


120
124
130
115
22
107
188
114
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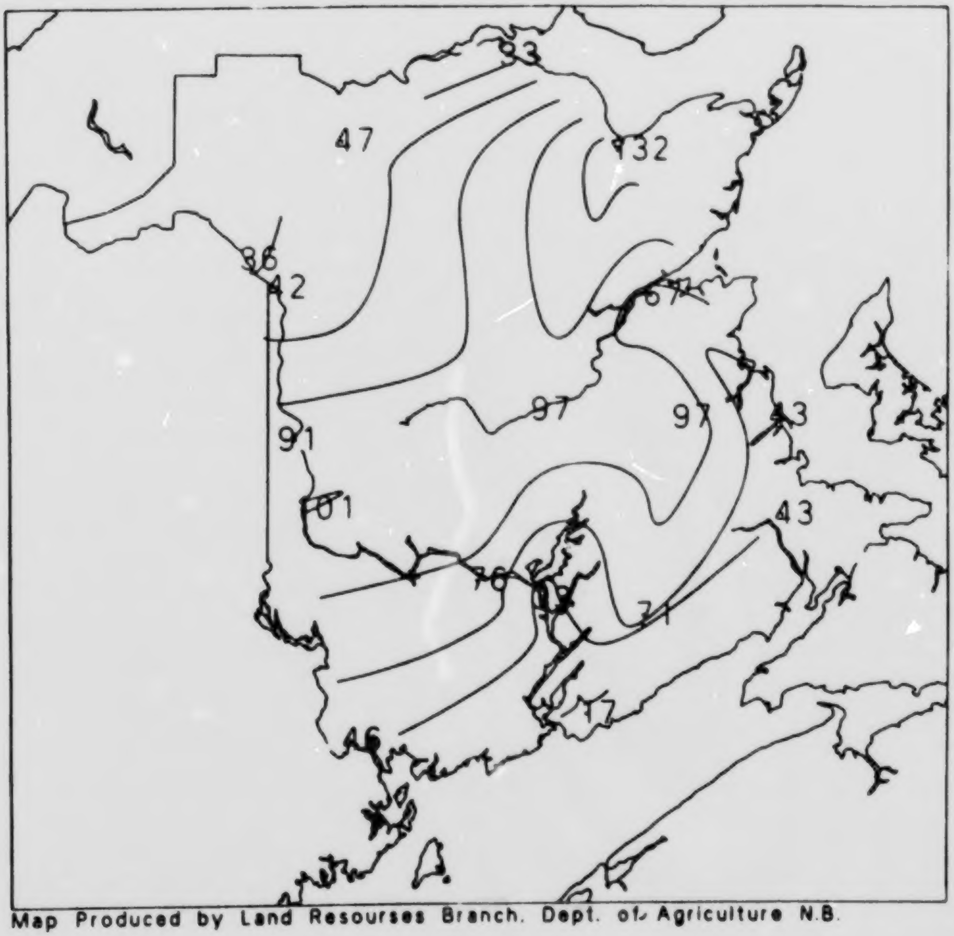
23
116
103
34
140
96
69

Map Produced by Land Resources Branch. Dept. Agriculture N.B.

FIGURE 2:

PERCENT OF NORMAL PRECIPITATION
JUNE 1991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101
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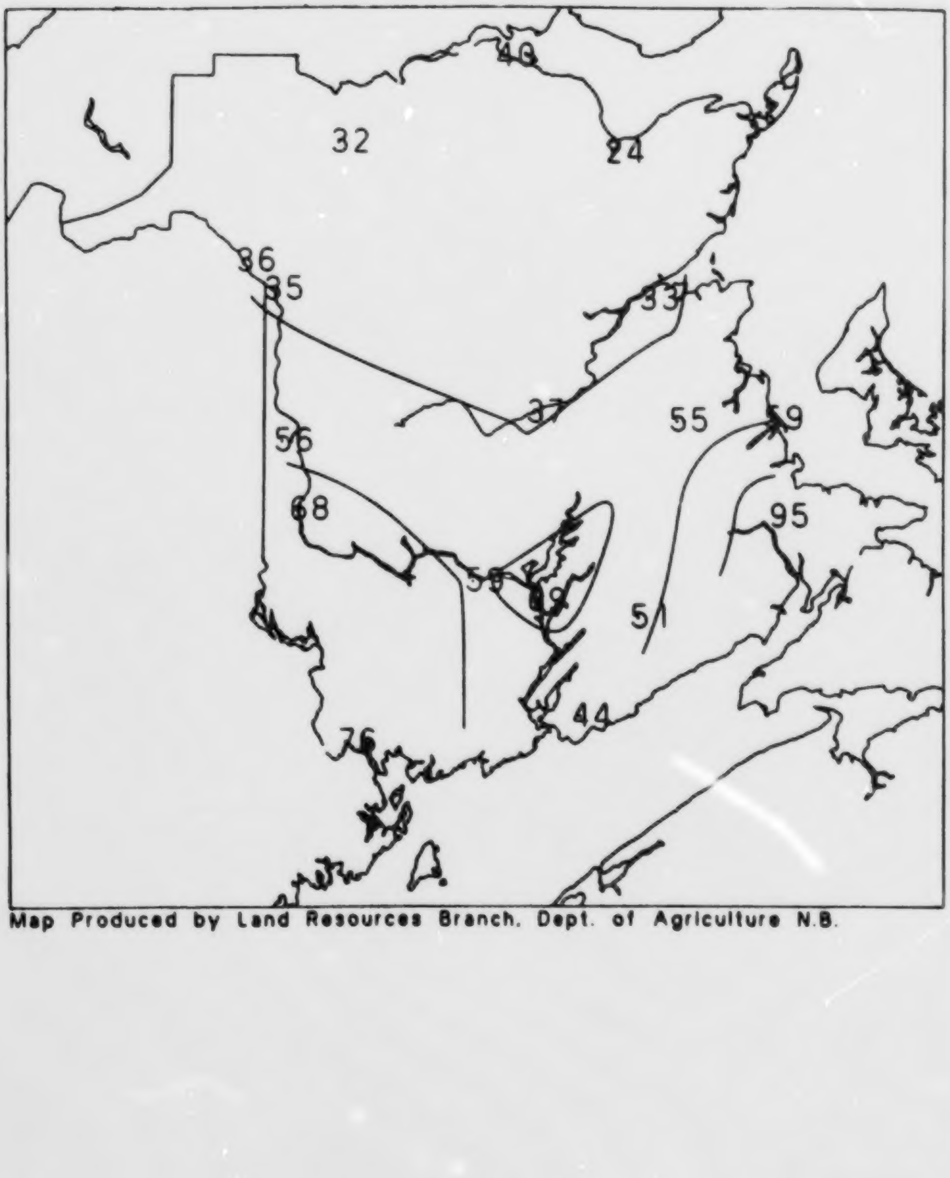
46
77

Map Produced by Land Resourses Branch. Dept. of Agriculture N.B.

FIGURE 3:

PERCENT OF NORMAL PRECIPITATION
JULY 1991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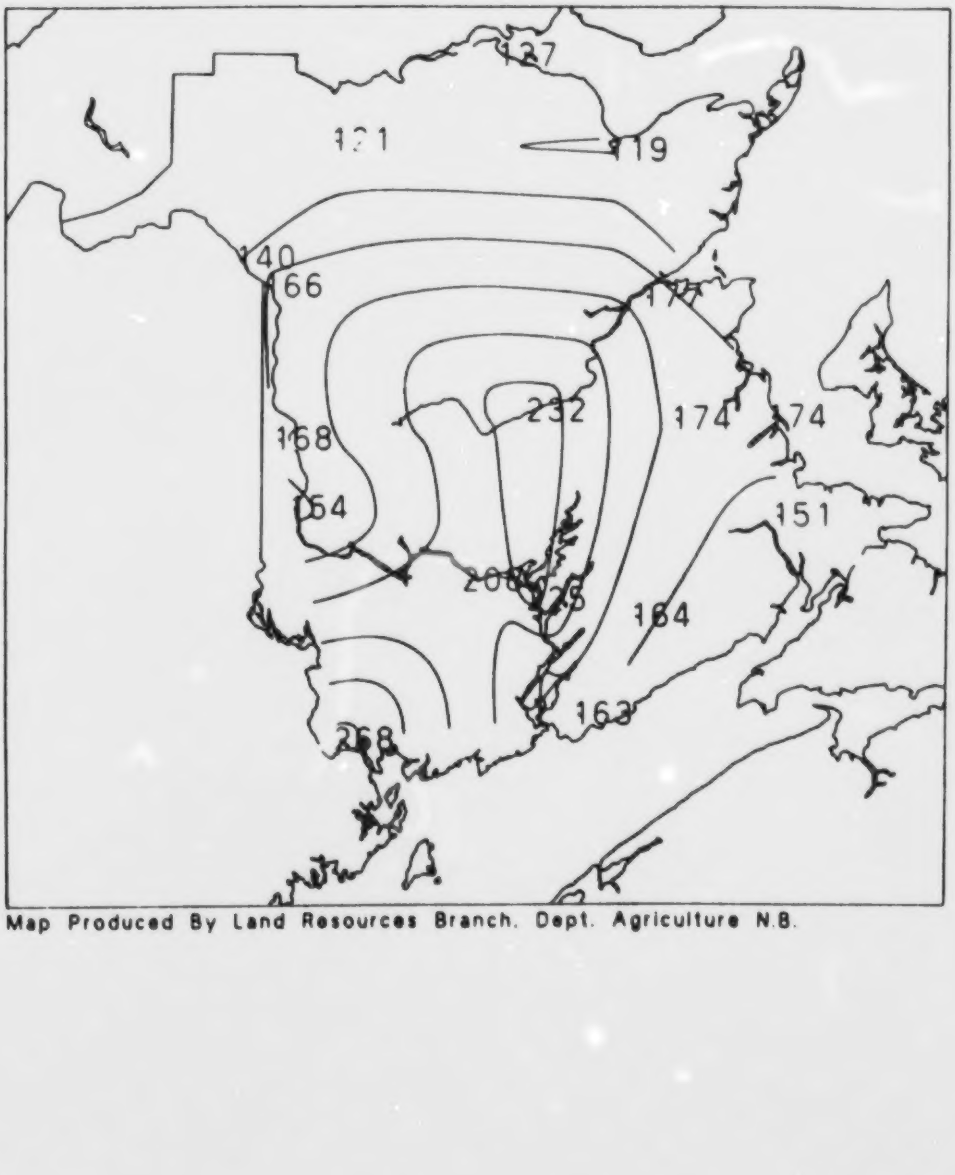
44
76

Map Produced by Land Resources Branch, Dept. of Agriculture N.B.

FIGURE 4:

PERCENT OF NORMAL PRECIPITATION AUGUST 1991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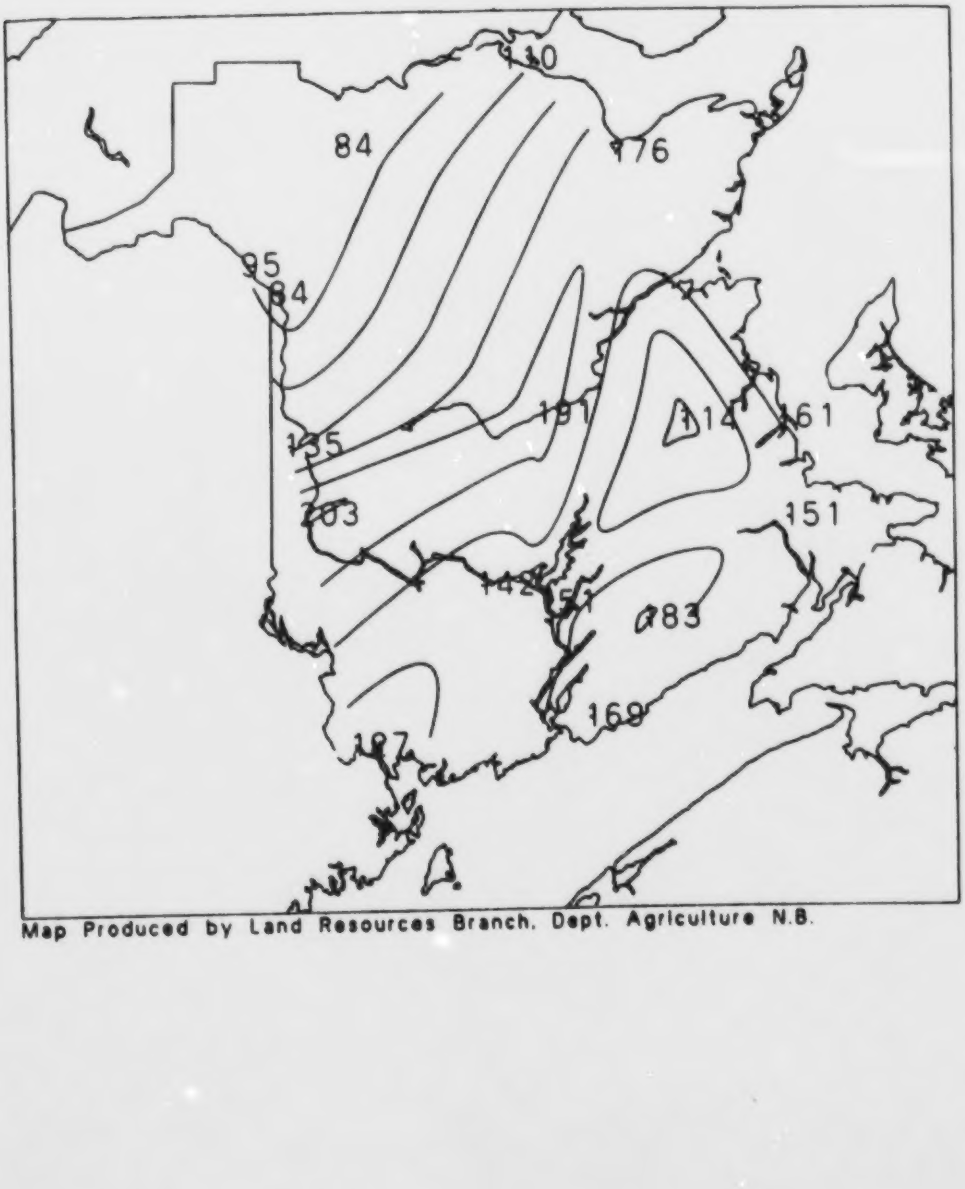
119
140
166
232
174
74
168
154
151
164
163

Map Produced By Land Resources Branch, Dept. Agriculture N.B.

FIGURE 5:

PERCENT OF NORMAL PRECIPITATION SEPTEMBER 1991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176
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84
135
191
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203
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183
169
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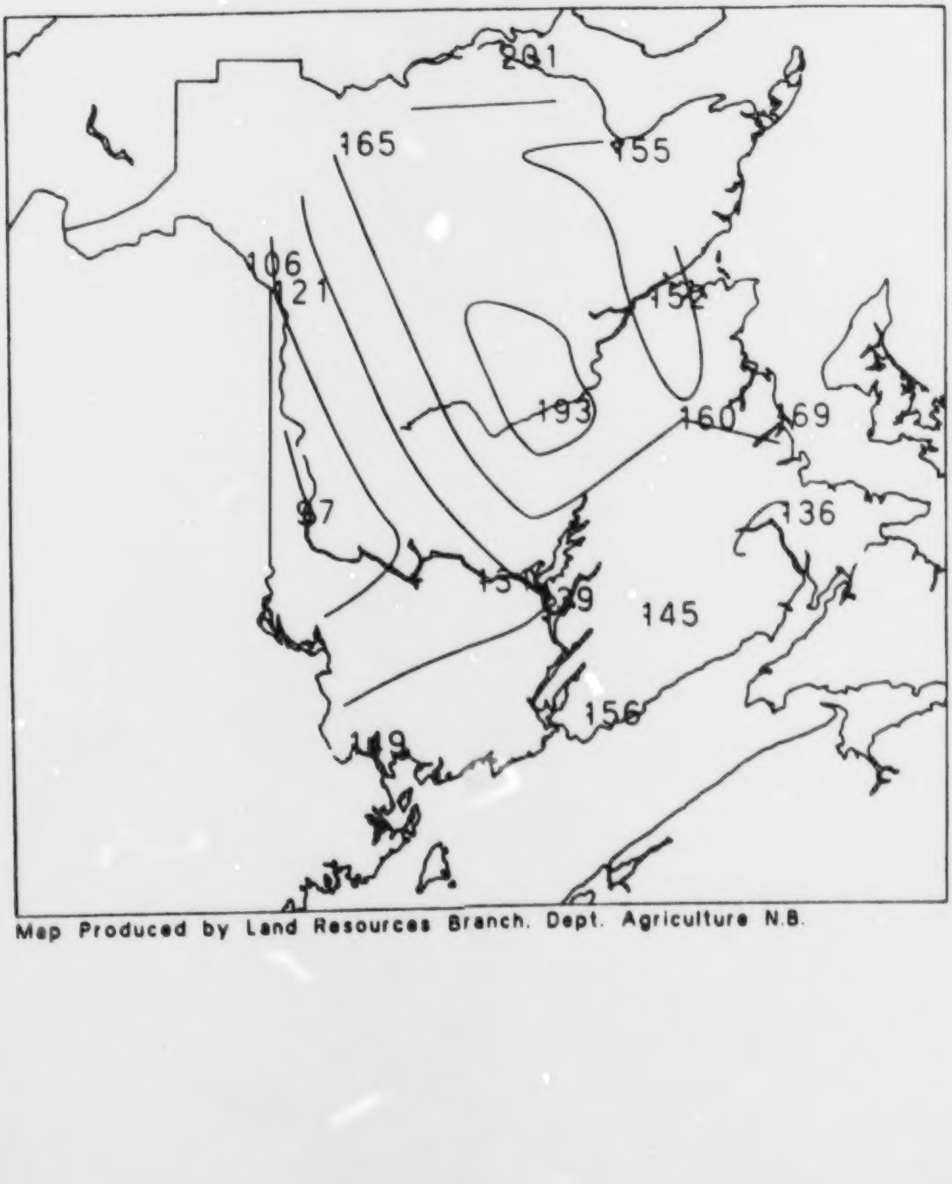
Map Produced by Land Resources Branch, Dept. Agriculture N.B.

FIGURE 6:

PERCENT OF NORMAL GDD > 5 DEGREES C.
(FROM MAY 1, 1991)

MAY 1991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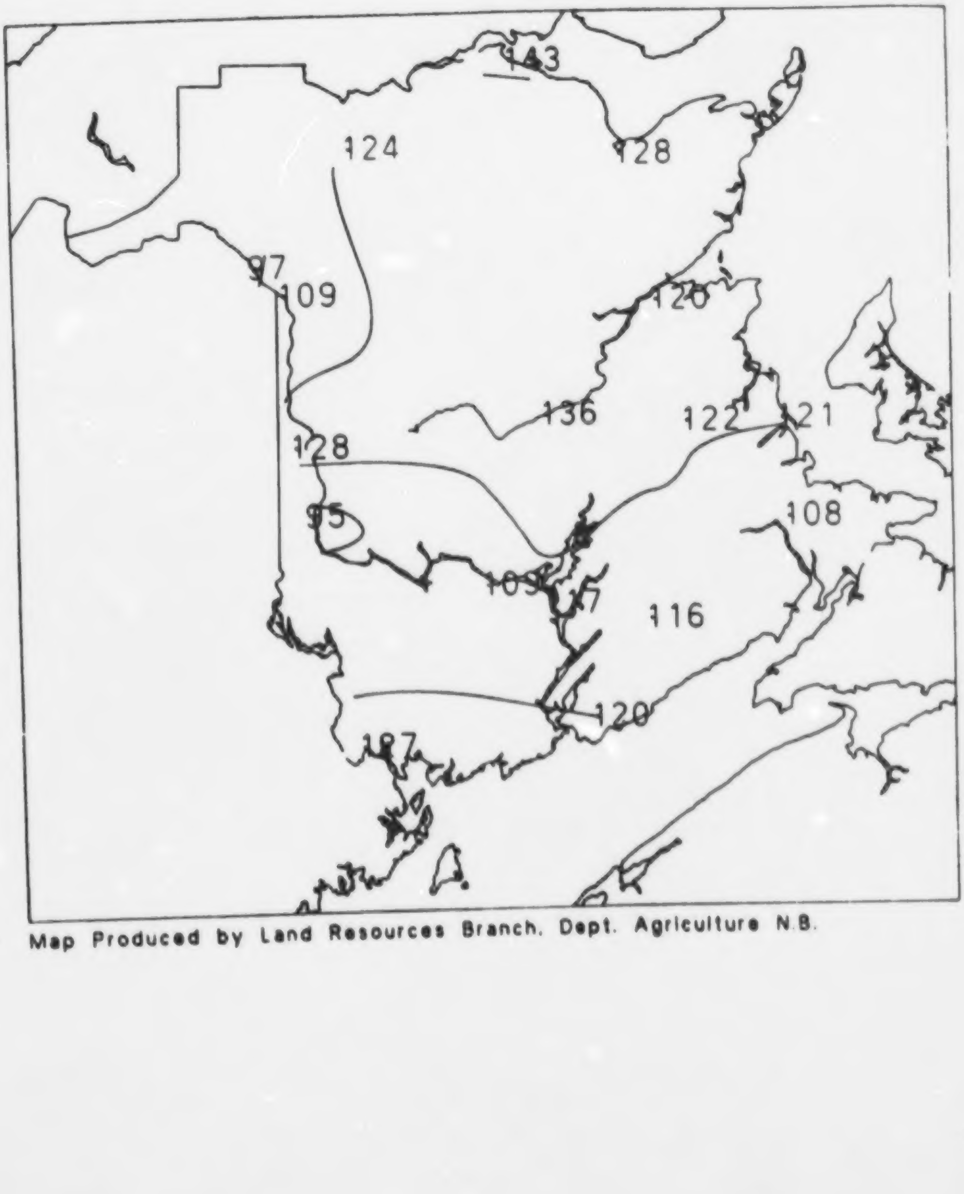
149

Map Produced by Land Resources Branch. Dept. Agriculture N.B.

FIGURE 7:

PERCENT OF NORMAL GDD > 5 DEGREES C. (FROM MAY 1, 1991)

JUNE 1991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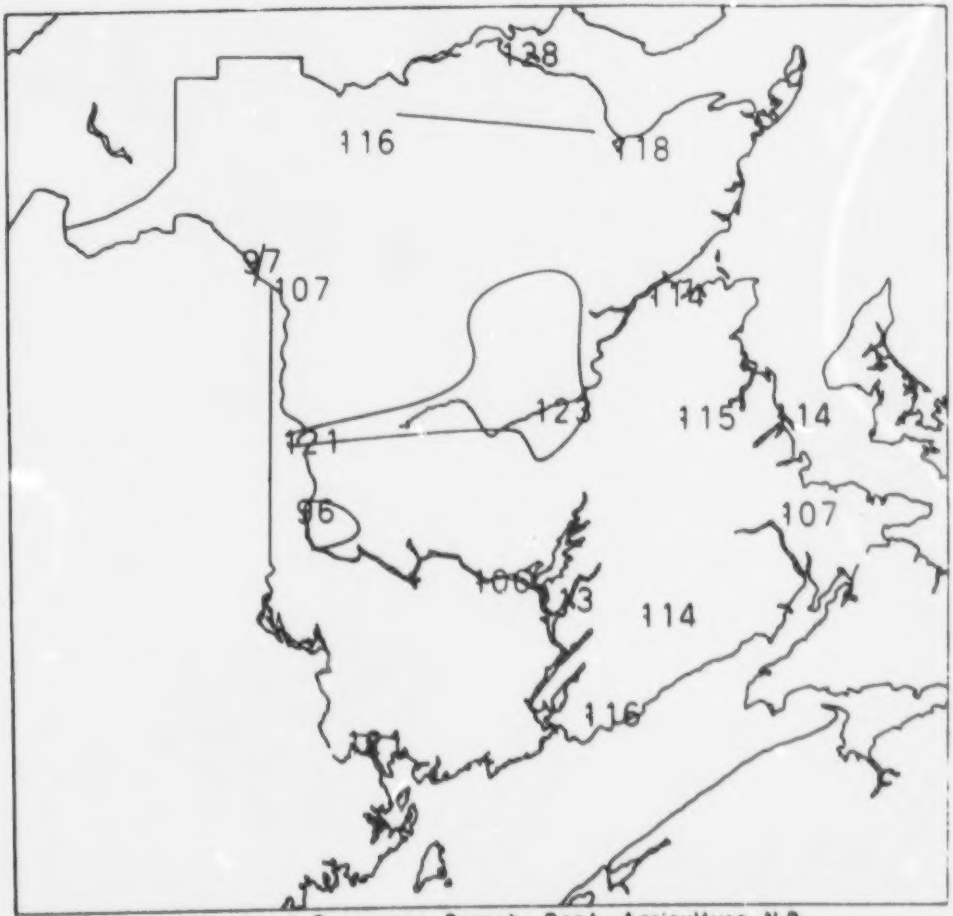
Map Produced by Land Resources Branch, Dept. Agriculture N.B.

FIGURE 8:

PERCENT OF NORMAL GDD > 5 DEGREES C. (FROM MAY 1, 1991)

JULY 1991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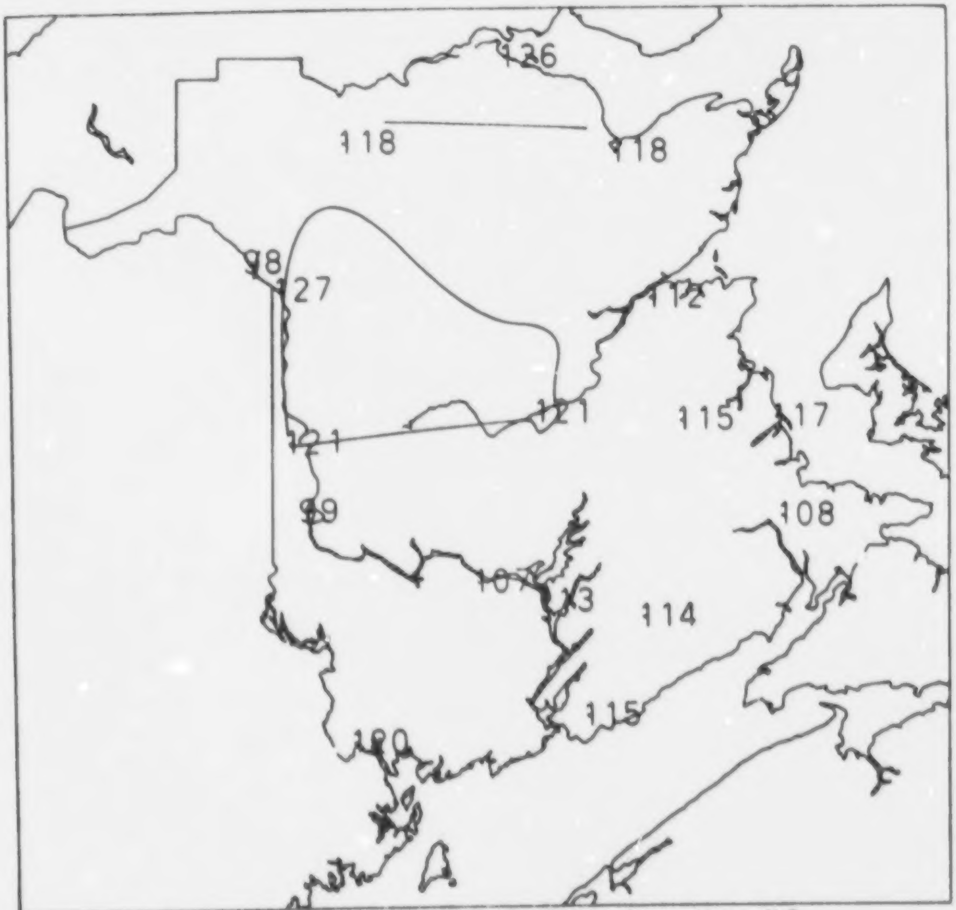
Map Produced by Land Resources Branch, Dept. Agriculture N.B.

FIGURE 9:

PERCENT OF NORMAL GDD > 5 DEGREES C. (FROM MAY 1, 1991)

AUGUST 1991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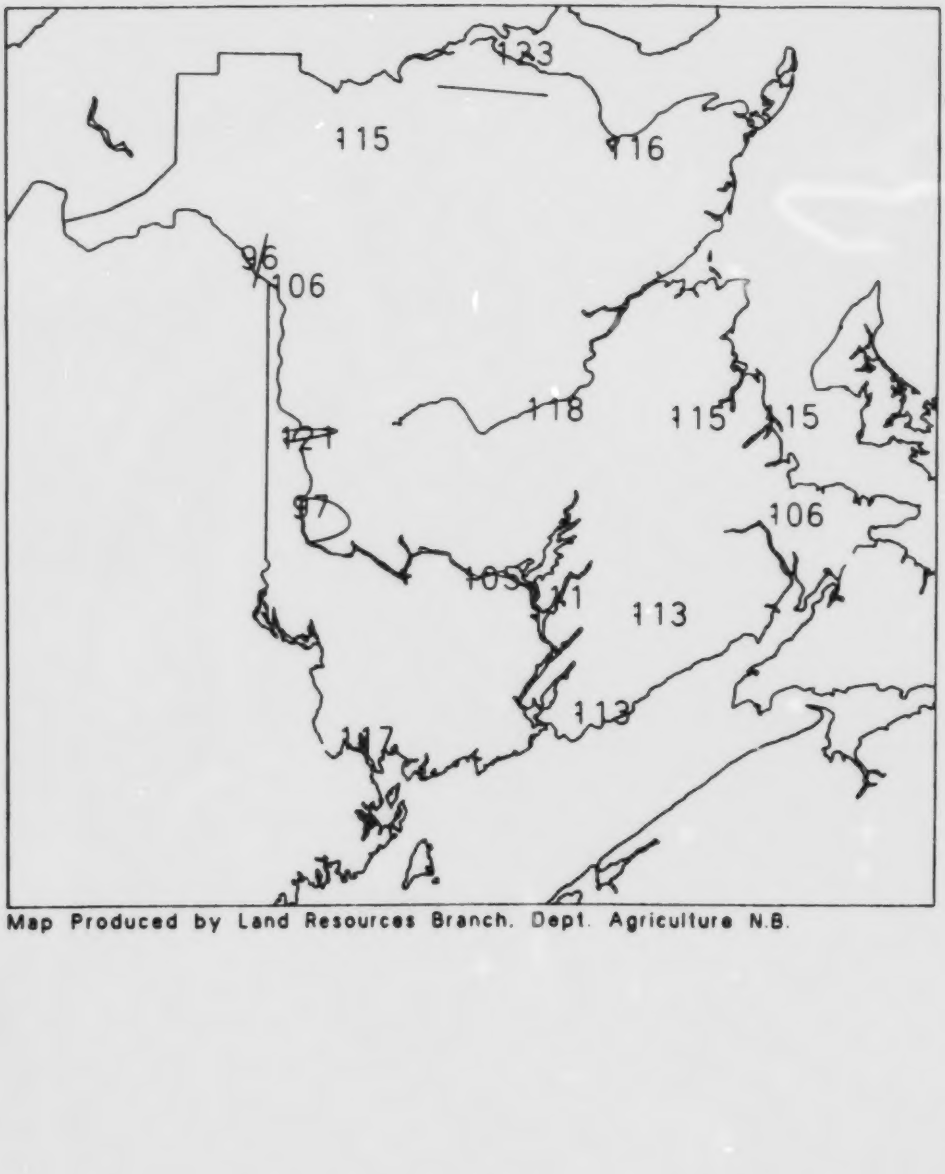
100

Map Produced by Land Resources Branch. Dept. Agriculture N.B.

FIGURE 10:

PERCENT OF NORMAL GDD > 5 DEGREES C. (FROM MAY 1, 1991)

SEPTEMBER 1991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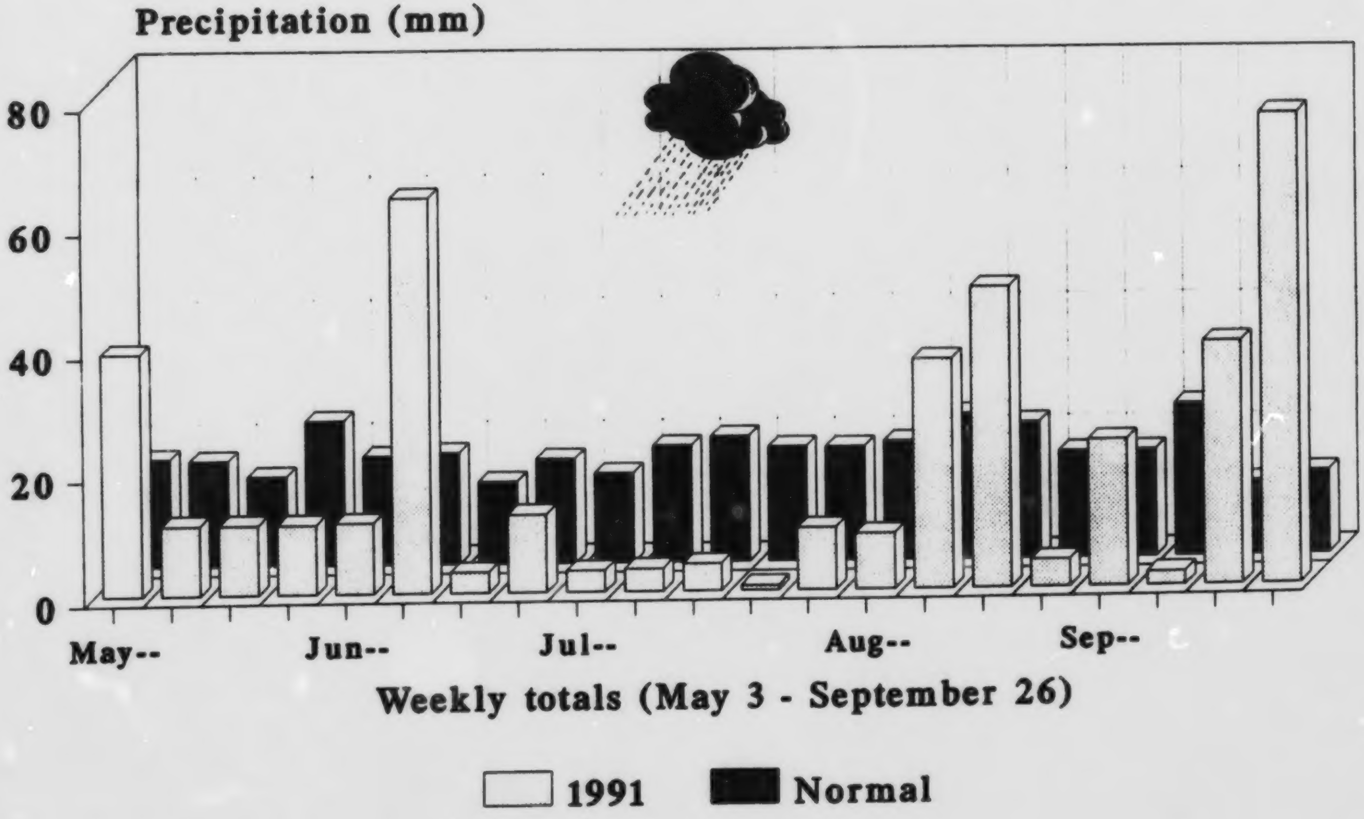
117

Map Produced by Land Resources Branch, Dept. Agriculture N.B.

BATHURST - PRECIPITATION CHART
for Growing Season
(1991 data compared to normal)



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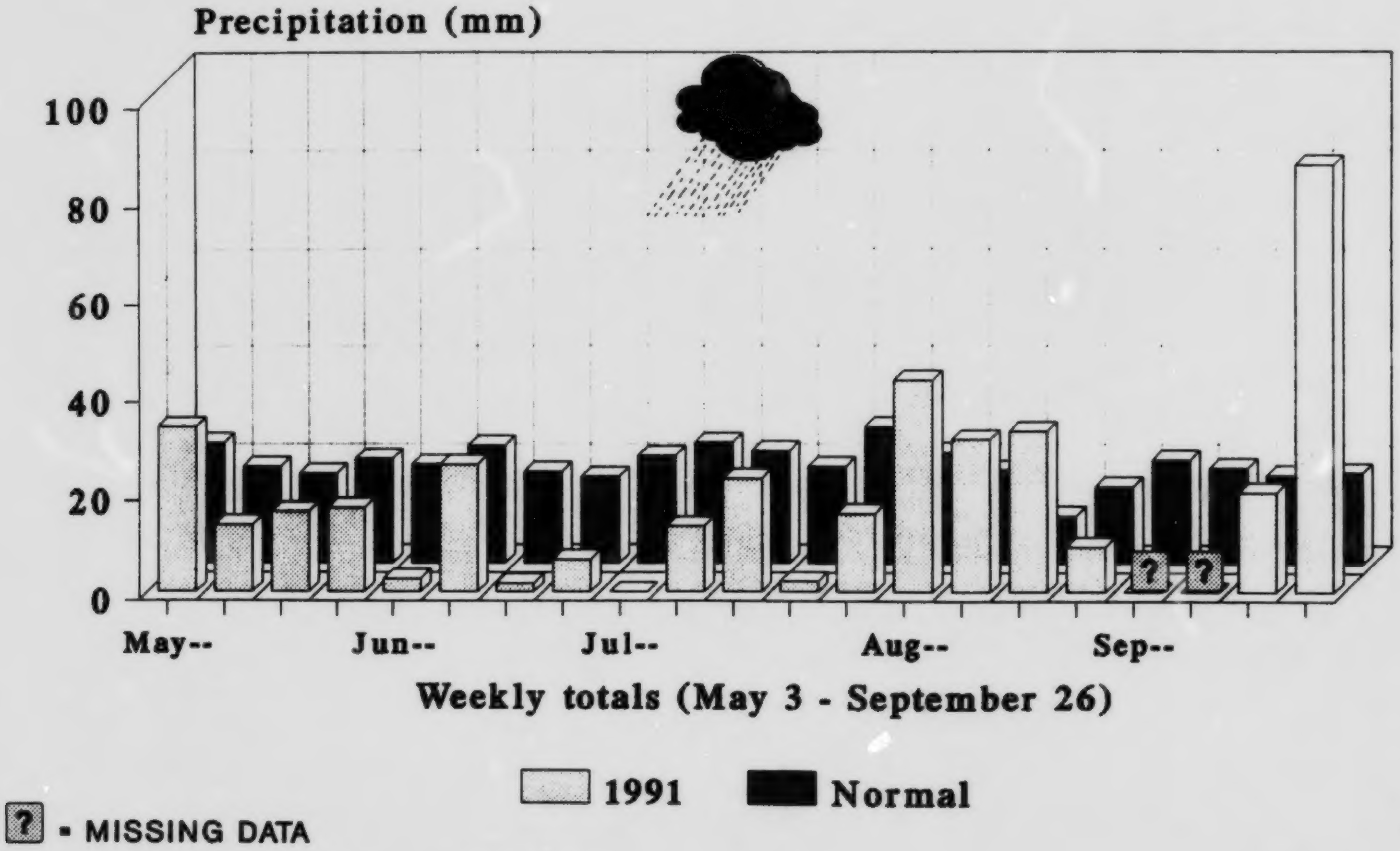
N.B. DEPARTMENT OF AGRICULTURE

BOUCTOUCHE - PRECIPITATION CHART

for Growing Season

(1991 data compared to normal)



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CHATHAM - PRECIPITATION CHART

for Growing Season

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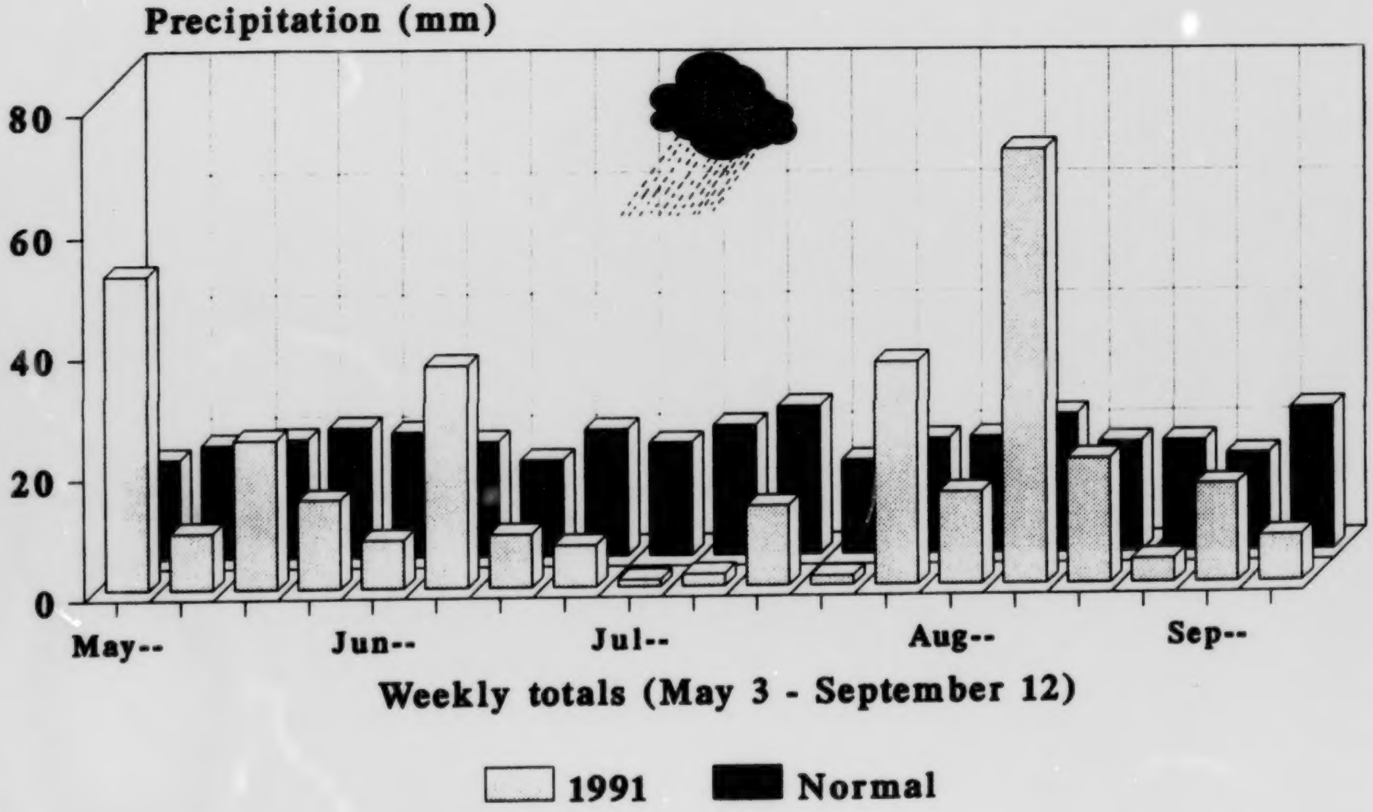

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FREDERICTON - PRECIPITATION CHART

for Growing Season

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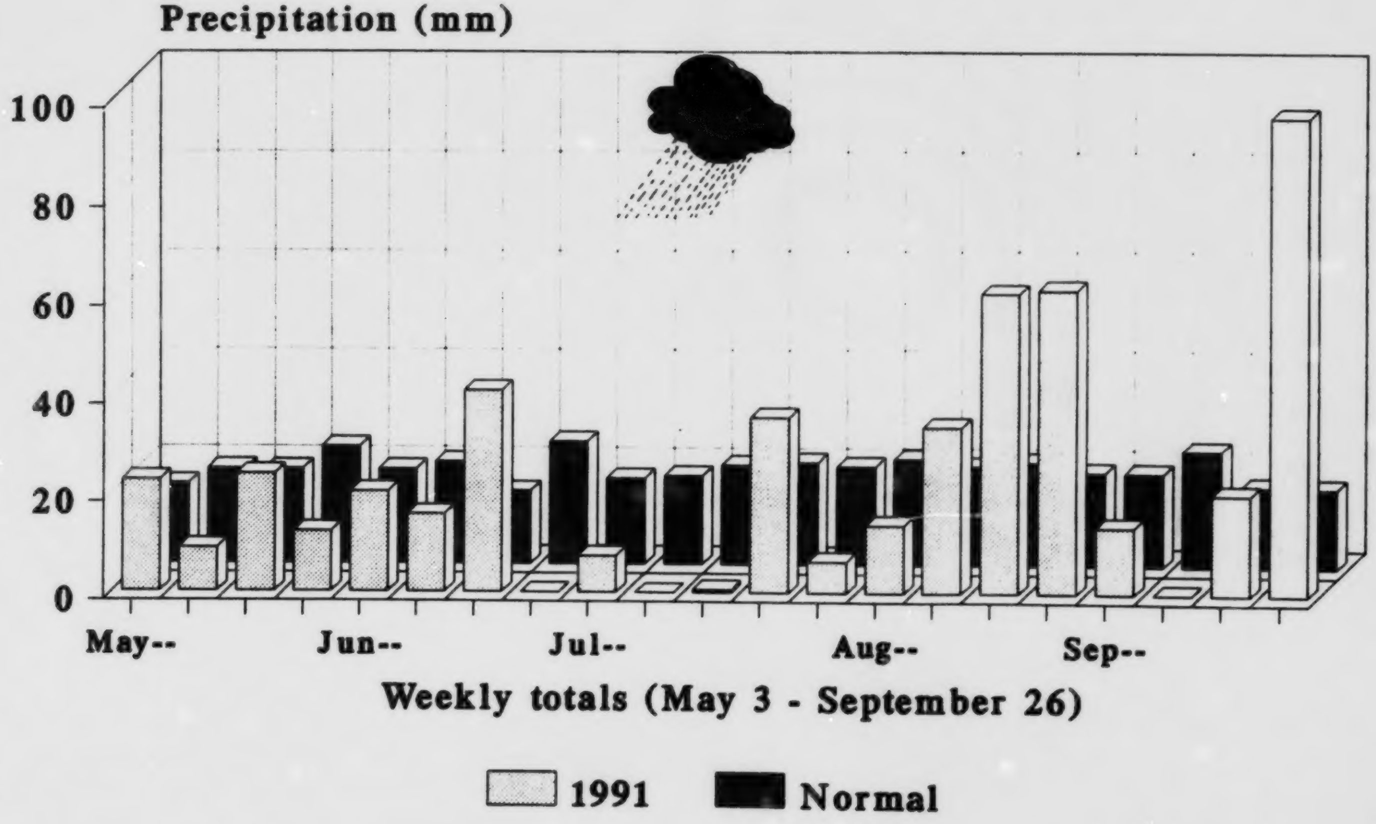

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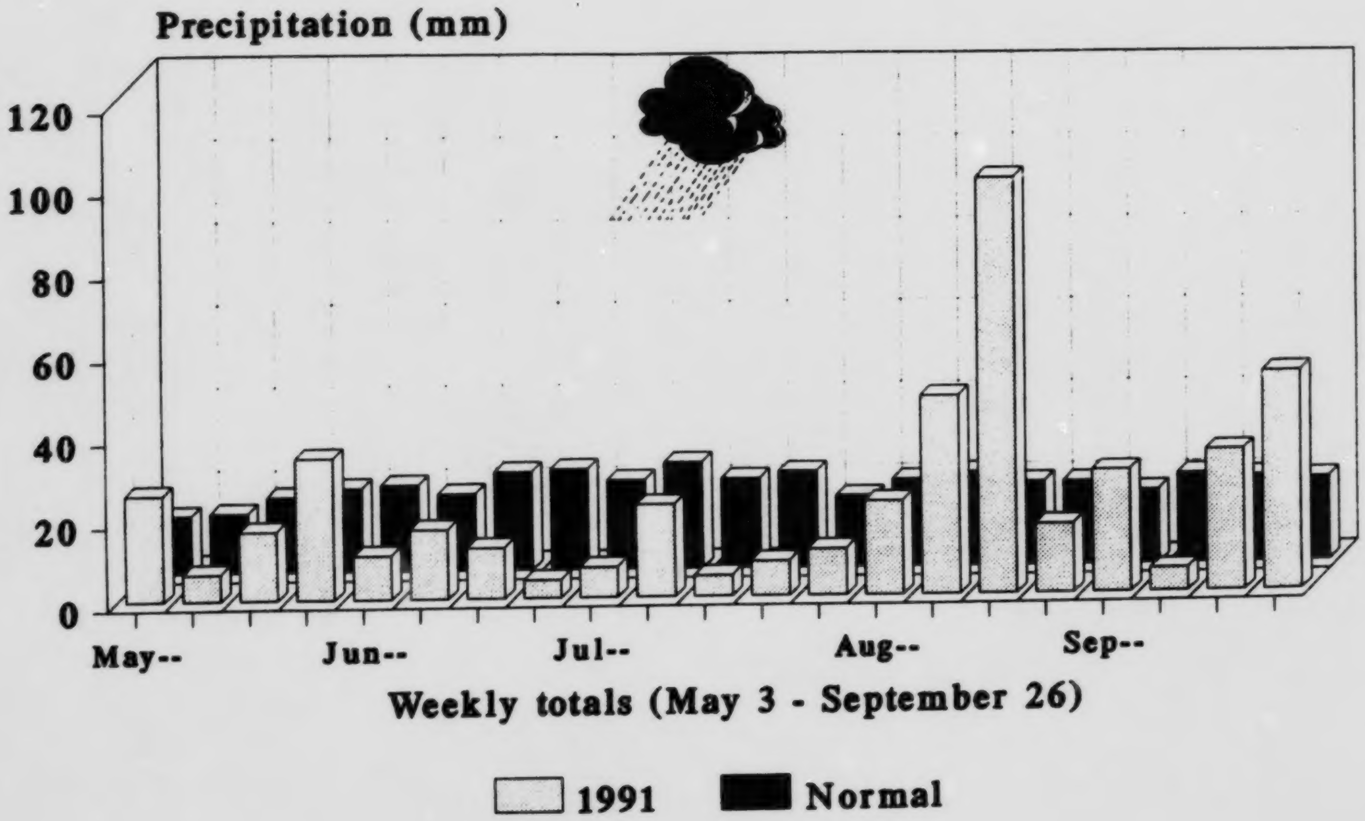
GRAND FALLS - PRECIPITATION CHART

for Growing Season

(1991 data compared to normal)



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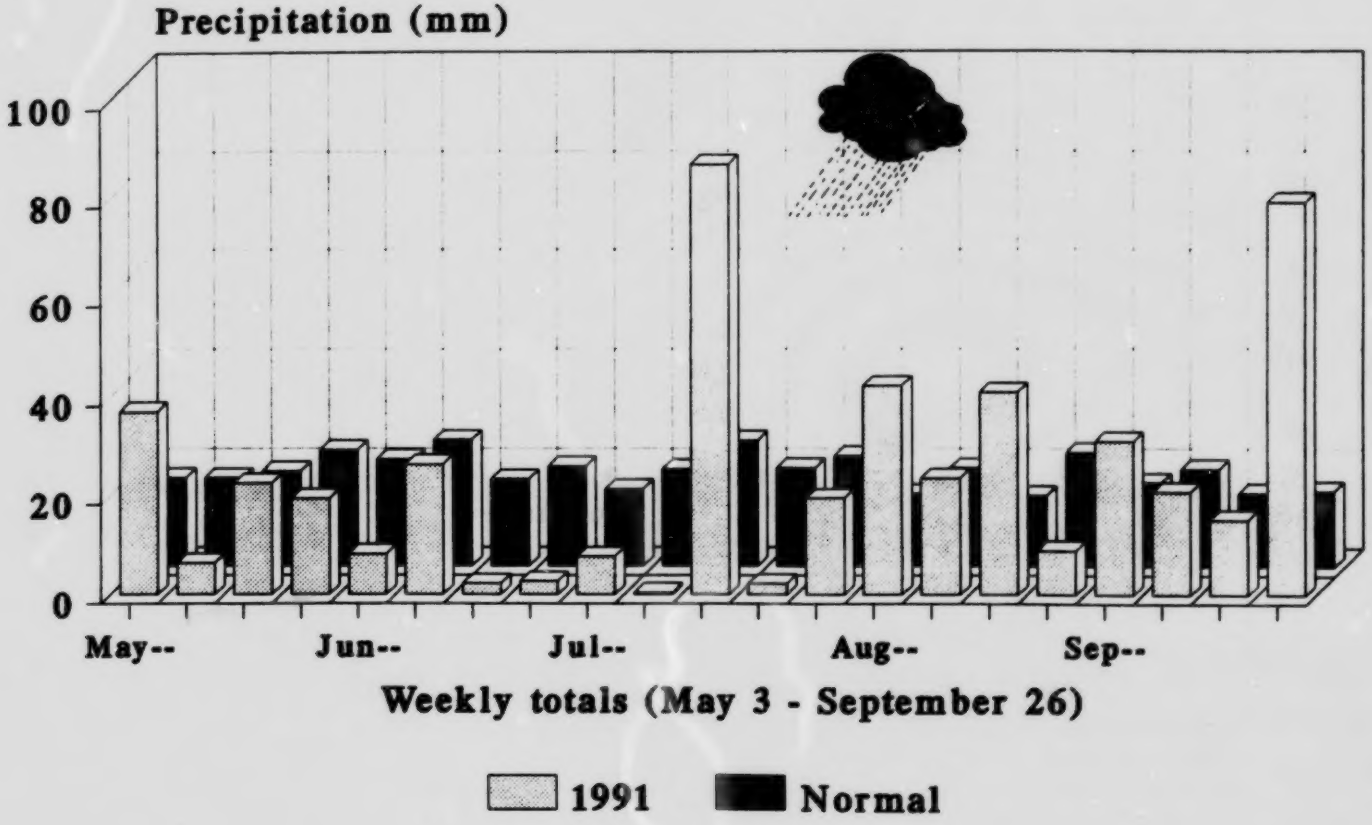
N.B. DEPARTMENT OF AGRICULTURE

MONCTON - PRECIPITATION CHART
for Growing Season
(1991 data compared to normal)



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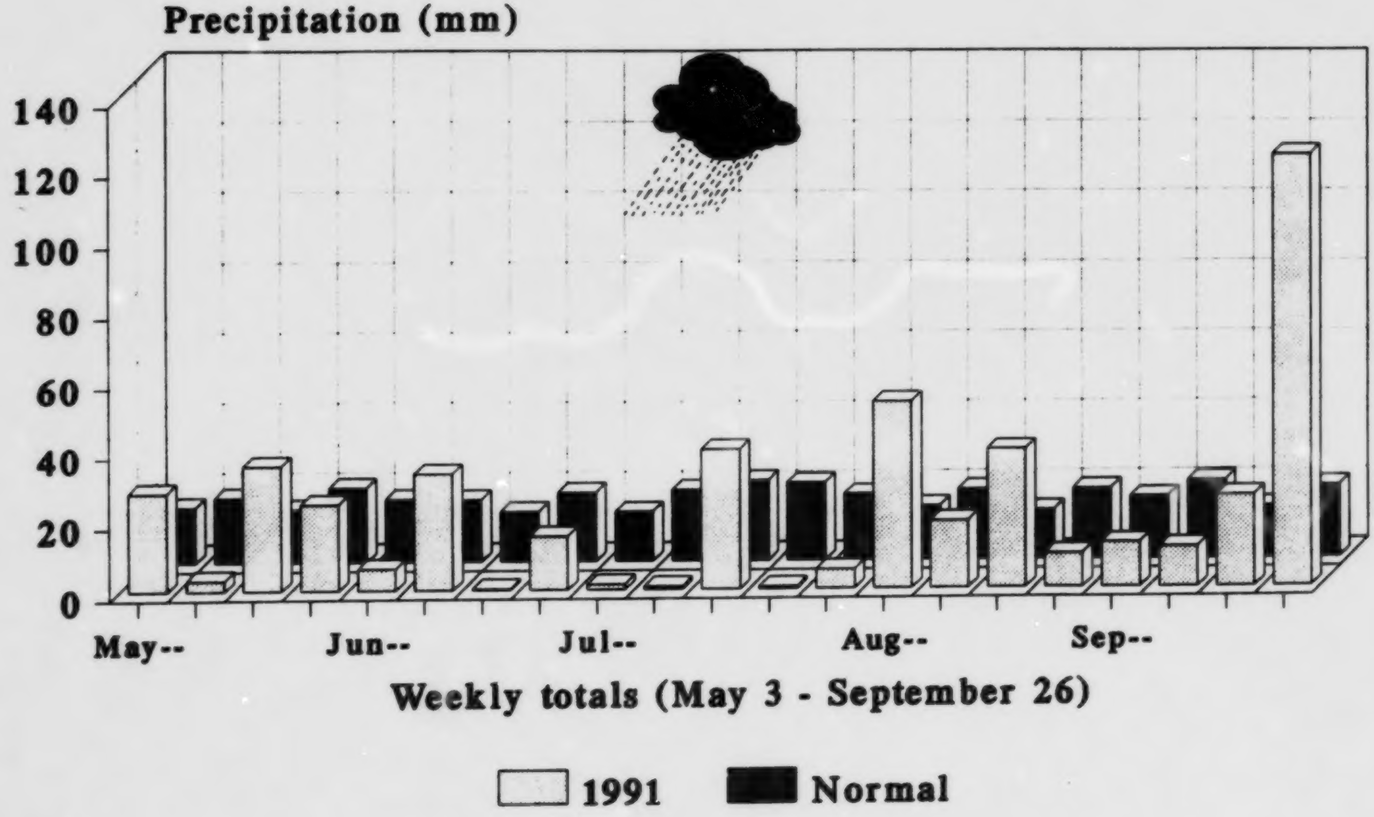
SUSSEX - PRECIPITATION CHART

for Growing Season

(1991 data compared to normal)



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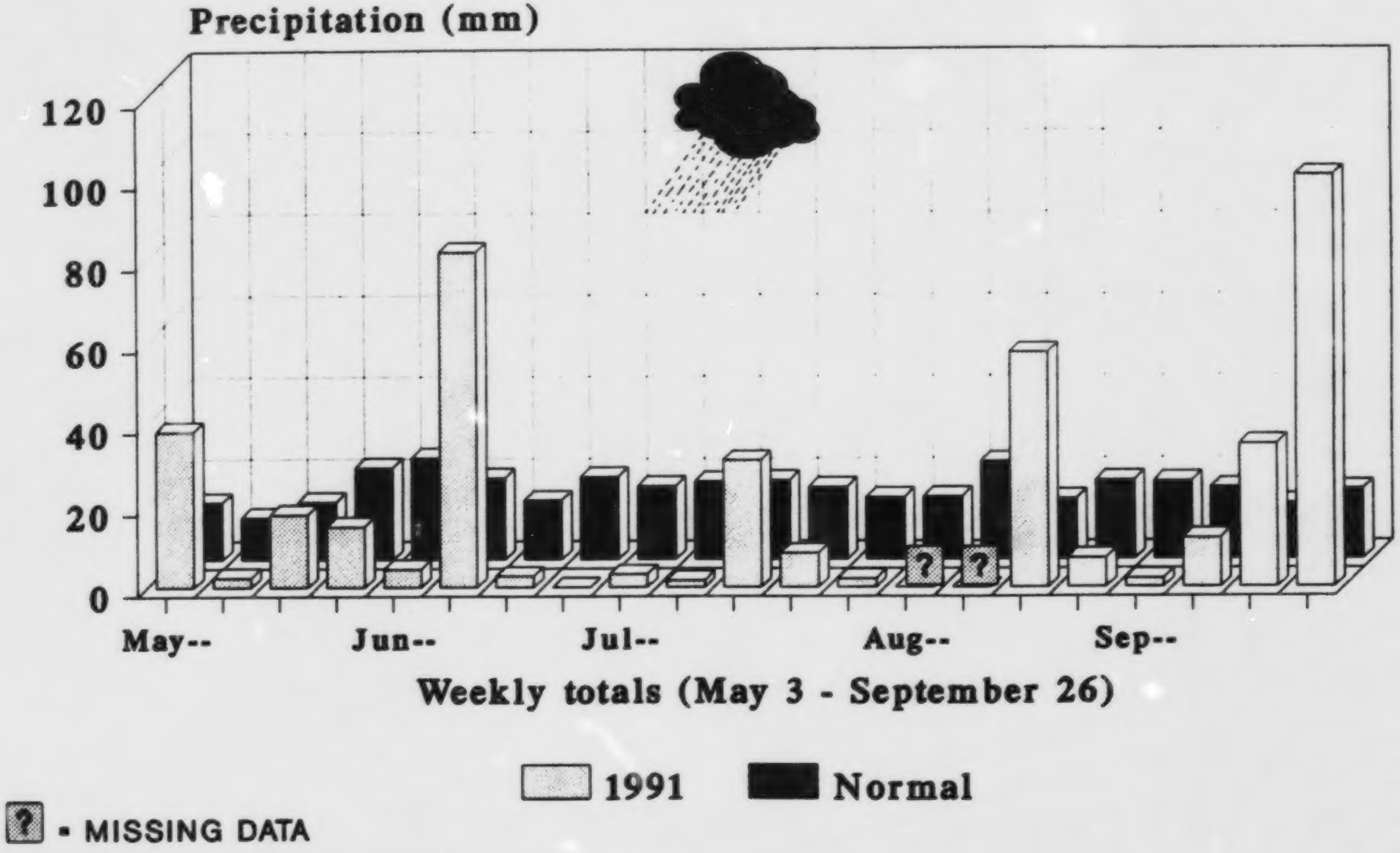
WOODSTOCK - PRECIPITATION CHART

for Growing Season

(1991 data compared to normal)



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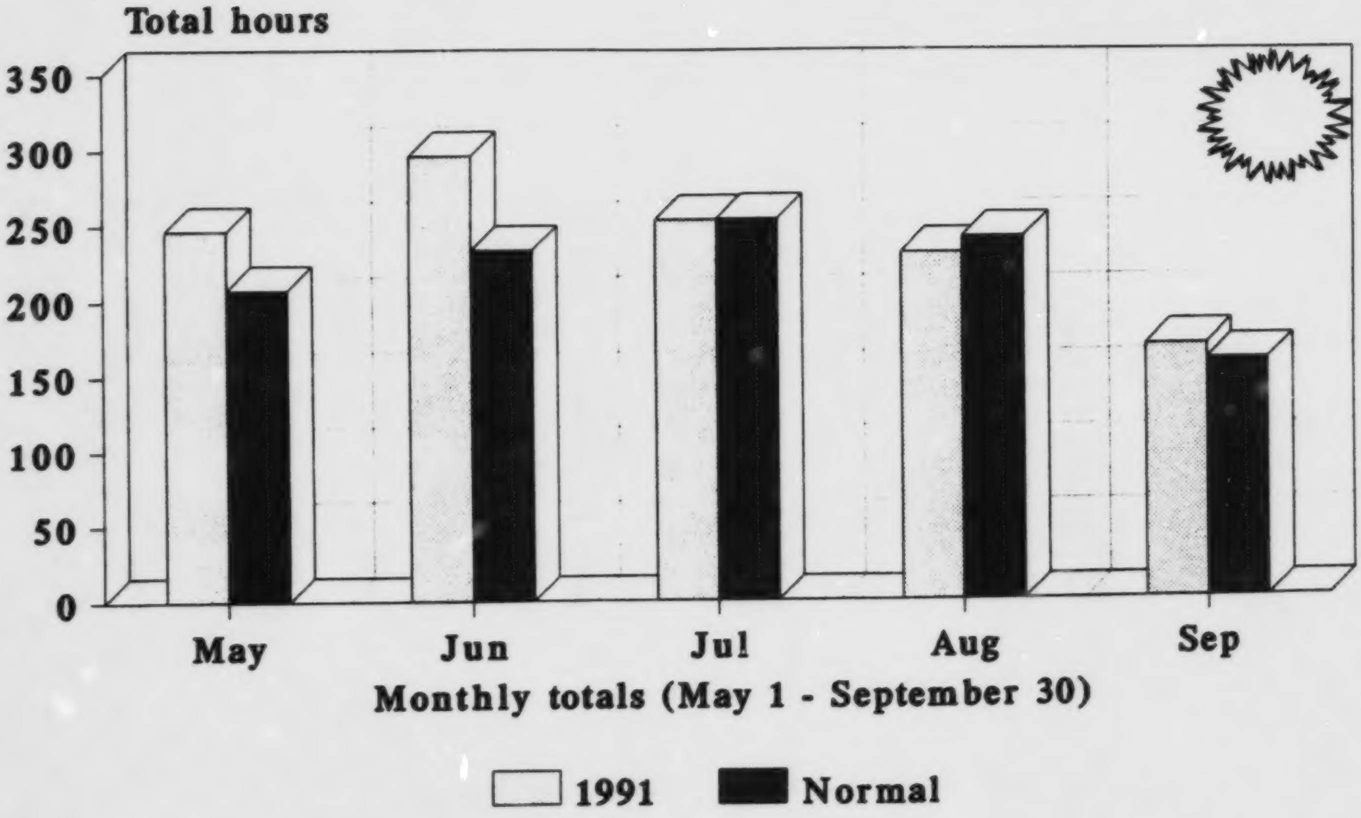
N.B. DEPARTMENT OF AGRICULTURE

CHARLO (A) - SUNSHINE HOURS
for Growing Season
(1991 data compared to normal)



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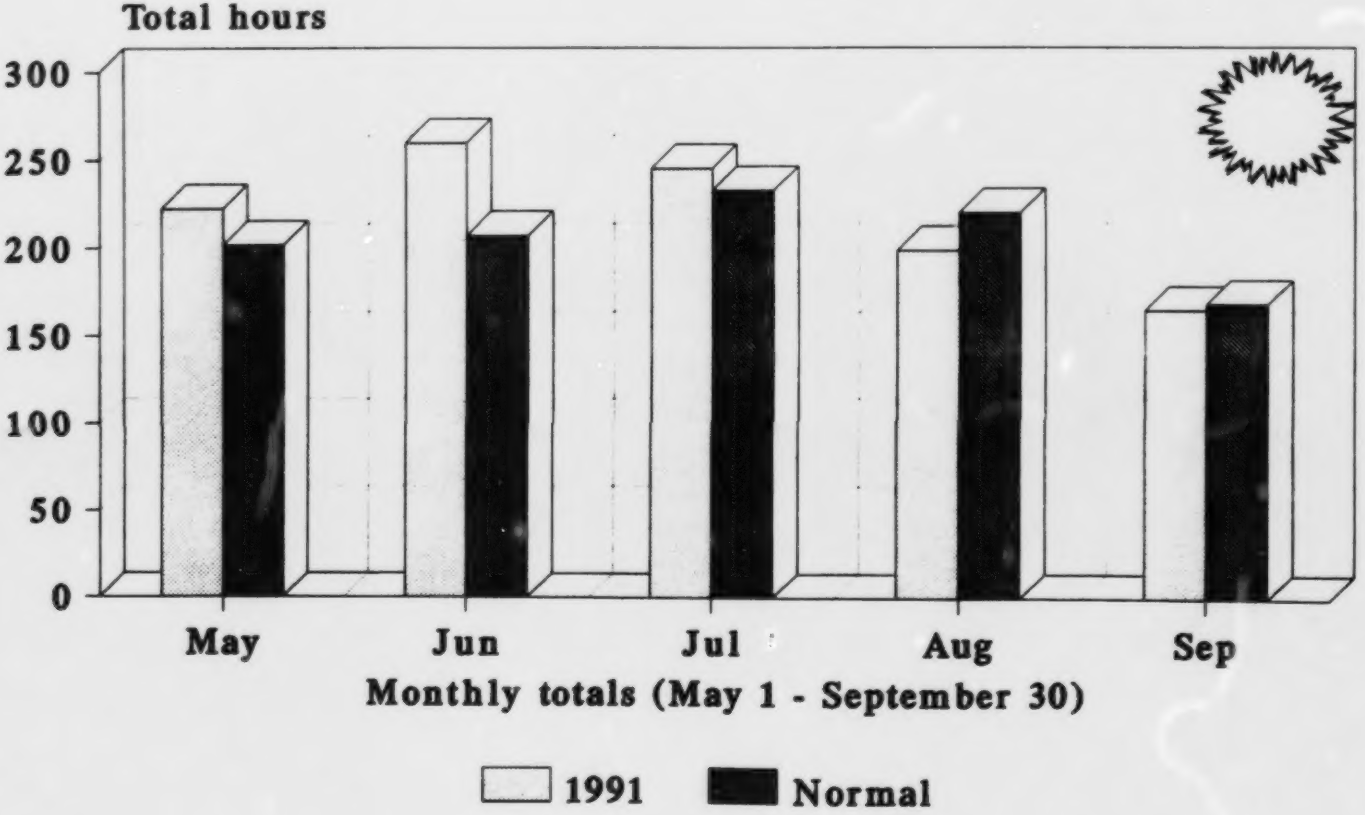
FREDERICTON (A) - SUNSHINE HOURS

for Growing Season

(1991 data compared to normal)



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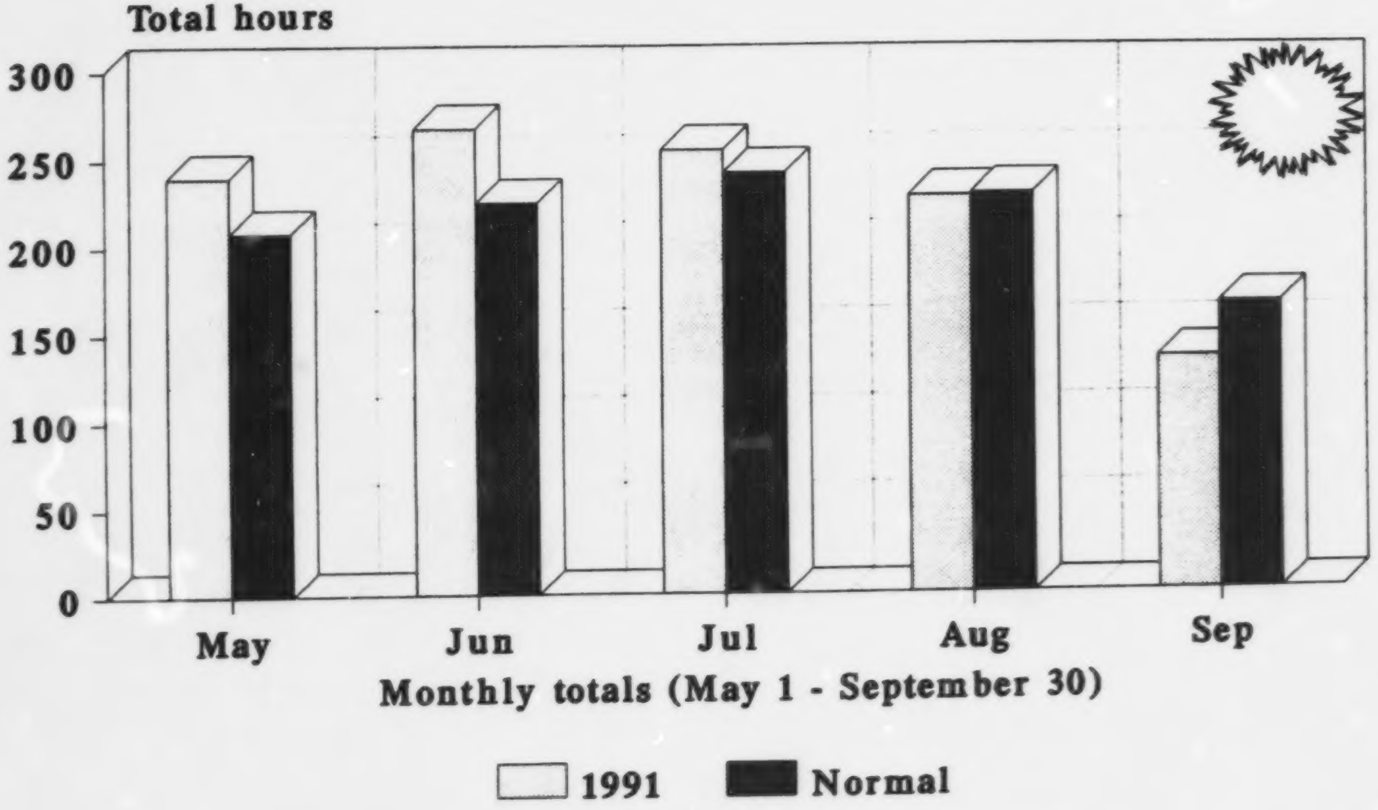
MONCTON (A) - SUNSHINE HOURS

for Growing Season

(1991 data compared to normal)



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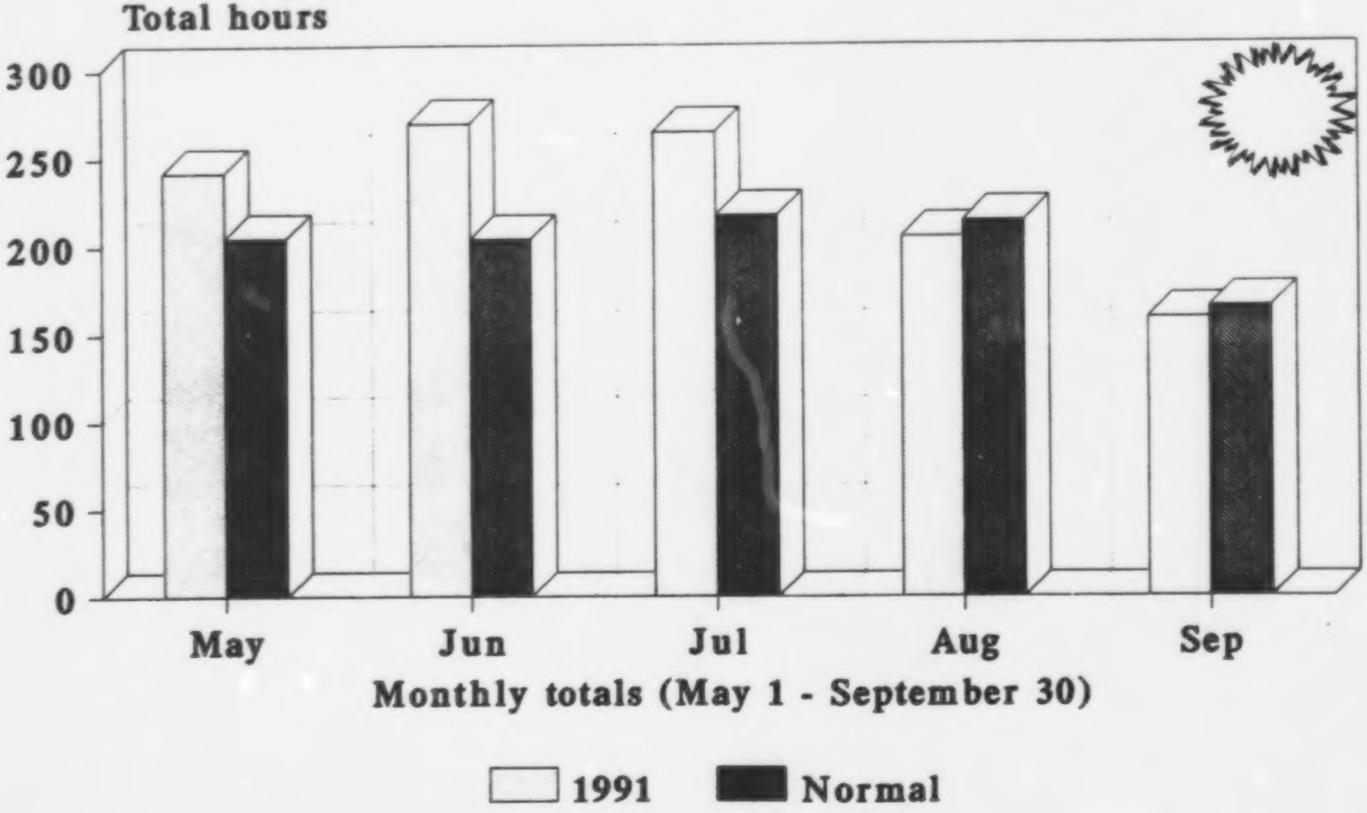
SAINT JOHN (A) - SUNSHINE HOURS
for Growing Season
(1991 data compared to normal)



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NUMBER OF DAYS WITH MEASURABLE RAINFALL

LOCATION	MAY		JUNE		JULY		AUGUST		SEPTEMBER	
	NORMAL	1991	NORMAL	1991	NORMAL	1991	NORMAL	1991	NORMAL	1991
WOODSTOCK	9	10*	11	5	11	10	11	7*	10	7
GRAND FALLS	12	14	12	9	14	9	13	16	12	10
BATHURST	12	15	12	12	13	7	12	19	11	10
SUSSEX	9	11	9	10	8	6	7	15	7	12
BOUCTOUCHE	13	16	13	8*	11	14*	11	15*	10	9*
SAINT JOHN	13	10*	14	9	12	8	12	15	12	12

* MISSING DATA

DEVELOPMENT OF A COST-EFFECTIVE METHOD FOR ACID DECOMPOSITION OF ANIMAL FEED AND PLANT TISSUE USING MICROWAVE ENERGY

Janice Howard

Abstract: A microwave digestion system was incorporated into routine laboratory analysis of macro and trace elements in plant tissue and compost samples to replace conventional Dry Ash extraction. The series of microwave analyses demonstrated 100% recovery of iron and manganese in highly concentrated samples, compared to the conventional Dry Ash recovery of 50%. The method proved to be cost-effective for samples requiring accurate high range iron and manganese results (eg. compost and manure), but not economical for routine analysis.

MISE AU POINT D'UNE MÉTHODE EFFICACE PAR RAPPORT AUX COÛTS POUR LA DÉCOMPOSITION ACIDE D'ALIMENTS D'ANIMAUX ET DE TISSUS VÉGÉTAUX AU MOYEN DES MICRO-ONDES

Janice Howard

RÉSUMÉ : On a intégré un système de décomposition par micro-ondes dans les analyses courantes en laboratoire des macro-éléments et des oligo-éléments de tissus végétaux et d'échantillons de compost en vue de remplacer la méthode conventionnelle d'extraction par cendres sèches. Les essais par micro-ondes ont donné une récupération à 100 % du fer et du manganèse dans des échantillons très concentrés en comparaison avec une récupération de 50 % au moyen de la méthode conventionnelle des cendres sèches. La nouvelle méthode s'est révélée rentable pour les échantillons nécessitant des résultats précis et une forte teneur en fer et en manganèse (compost et engrais), mais non économique pour des analyses ordinaires.

INTRODUCTION: The CEM Microwave Digestion System (MDS-81D) was acquired to substantially improve recovery of trace elements (especially Fe and Mn) for plant tissue and compost samples. The system is intended to prepare digestates for analysis of calcium, magnesium, phosphorus, potassium, zinc, boron, manganese, iron, and copper.

The purpose of these experiments was to derive the best procedure to operate MDS-81D from successive reductions of parameters. This was essentially a "trial and error" approach which isolated each parameter until its optimum operating value was determined. The parameters under consideration were sample weight, acid concentrations, acid volumes, digestion time, and transmission power. Lowest possible acid concentrations (for safety and environmental considerations), shortest digestion times, and moderate sample weight (to reduce dilution-multiplication margin of error) were the primary objectives.

MATERIALS AND METHODS: Sample digestion was accomplished using a CEM Corporation MDS-81D Microwave Digestion System, consisting of a 600 Watt magnetron with transmission power adjustable in 1% increments. A rotating turntable spins at 6 RPM to prevent the occurrence of "hot spots". The digestion vessels are composed of CEM Perflouroalkoxy Teflon, equipped with a safety relief valve and sealed at a capping station to a 16.3 N.m. (12.0 ft lb) torque.

The analyses were performed using a Perkin-Elmer 5500 Inductively Coupled Plasma Atomic Emission Spectrophotometer (ICP) with a radio-frequency power supply and cross-flow nebulizer system.

The working standards were prepared from Fisher Scientific AA grade standards. The reference materials were acquired from the Association of American Feed Control Officials (AAFCO). Additionally, Standard Reference Materials from the National Bureau of Standards (NBS) were utilized (SRM 1572 citrus leaves ; SRM 2704 Buffalo River Sediment).

The samples analyzed were AAFCO and NBS materials. All samples within a run were analyzed in duplicate. The process began using the conditions depicted in Trial 1 (the "brute-force" method), recommended by another feed lab. The acid concentrations and digestion times were then adjusted. A cross-section of the testing conditions is depicted Table 1.

TABLE 1: Microwave Digestion Testing Conditions

Trial	Time (min)	%T	V HNO_3 (mls)	V HCl (mls)	% HNO_3	% HCl
1	27	100	10	5	100	100
2	20	100	10	5	67	50
3	15	100	10	5	50	25
4	10	100	10	5	25	10
5	10	100	10	5	10	10
6	10	100	10	5	5	5
7	6 min; 4 min	100; 50	10	5	70	50

The generic procedure was to place .5000g of sample in a digestion vessel. The sample was pre-digested with 10ml HNO_3 for 30 minutes, and subsequently 5ml of HCl was added. The vessels are then fitted with a pressure-release safety cap, and sealed using the CEM capping station. Following the microwave digestion, the vessels were allowed to cool to room temperature (approximately 30 minutes), and then manually vented. The resulting extract was made up to a final volume of 100ml with deionized water. Digestates were then analyzed for nine elements using ICP Emission Spectroscopy.

RESULTS AND DISCUSSION: Equivalent accuracy for trace metals provided in Trial 1 was achieved following the set of conditions outlined in Trial 4 (10 min, 100%T, 25%HNO_3, 10%HCl). Graphical representations of the data are presented in Appendix 1. Data is plotted for the "brute force" method (Trial 1), the optimum operating conditions observed (Trial 4), and conditions where the digestion was deficient (Trial 6). Trials within these two extremes met with varying degrees of success, with Fe and Mn being the distinguishing elements.

Several observations were noteworthy:

1. Correlation with both AAFCO and NBS were excellent for the method derived herein (Trial 4). Iron and manganese both exhibited a marked improvement in recovery from Dry Ashing in the highly concentrated samples extracted with the MDS system. The graphical analysis for Fe and Mn (Figures 7 and 8 respectively) demonstrates the enhanced recovery over Dry Ash (ca. twice as much).

2. At lower concentrations of the acids (Trials 5 and 6), satisfactory correlation for all elements except Fe exist.

3. Metal contamination was a critical problem throughout these experiments. The difficulty in eliminating it stemmed from its inconsistency, as it would appear randomly in some of the vessels within a set, and with different elements (usually Cu or Zn).

4. The application of concentrated acids yielded clear filtrates. As the concentrations of the acids were reduced, the filtrates became increasingly yellowed. Also, more residue in the digestion vessels is apparent, but this has been shown to consist of mainly organic components, as it shows no elemental content upon re-extraction and analysis.

5. Extensive yellowing of the peristaltic pump tubing is evident even at moderate acid concentrations.

CONCLUSIONS: The MDS-81D has been shown to be a viable and time-saving alternative to Dry Ash extraction for plant tissue and compost analysis, providing substantially better recovery of Fe and Mn in samples where these elements are present in high concentrations. Fe and Mn were found to have ca. 100% recovery, compared to the Dry Ash result of ca. 50% in the high Fe and Mn AAFCO samples. The Fe and Mn values for relatively low concentrations (that is <100 ppm) did not show a substantial improvement since the Dry Ash method is suitable at low concentrations of elements.

The difficulty with contamination was eradicated by cleaning the vessels with 10ml conc. HNO_3 at 100%T for 10 minutes after every digestion. This procedure must be included as a standard step of extraction. Thorough rinsing of the ICP nebulizer and torch assembly is also required, and the peristaltic pump tubing must be replaced after each use.

The method developed herein has not proven to be time-feasible or cost effective for mass extraction of samples, and for regular feed analysis it is of no benefit with respect to accuracy of the macro (Ca, Mg, P, or K) elements. Currently the method is available and recommended for those samples requiring high-range trace metal analysis (plant tissue and compost samples), and has proven to be reliable and efficient in this capacity.

REFERENCES: Aysola, P. et al. "Wet-Ashing in Biological Samples in a Microwave Oven Under Pressure Using Poly(tetraflouroethylene) Vessels. Anal. Chem.,59, 1987, pp. 1582-1583.

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APPENDIX 1

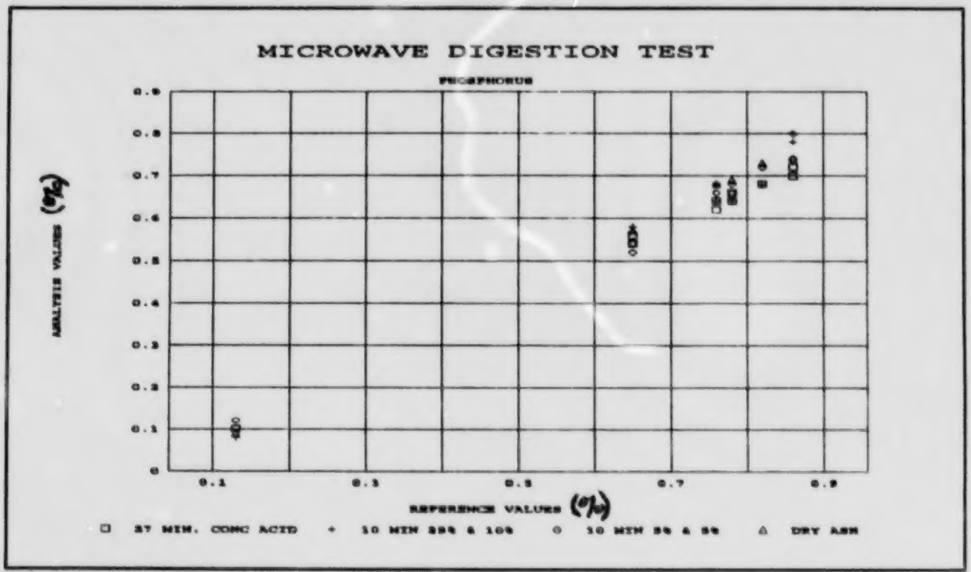

Figure 1 EFFECT OF MICROWAVE DIGESTION VS DRY ASH ON PHOSPHORUS

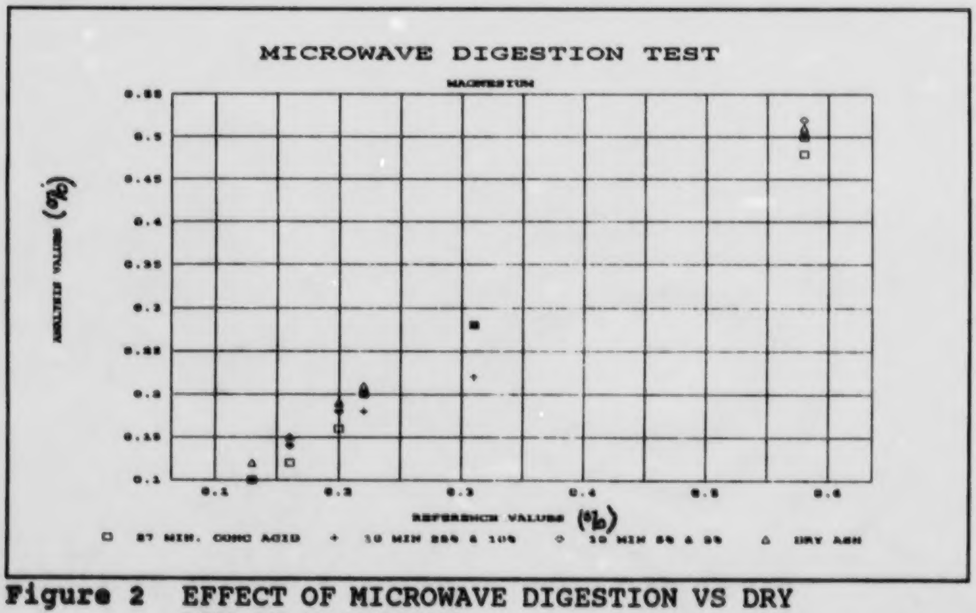

Figure 2 EFFECT OF MICROWAVE DIGESTION VS DRY ASH ON MAGNESIUM

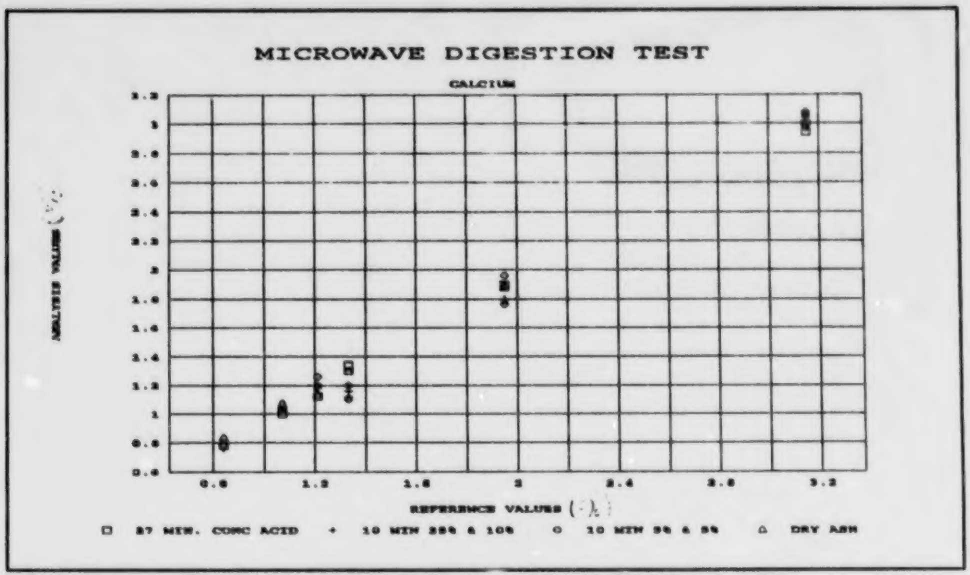

Figure 3 EFFECT OF MICROWAVE DIGESTION VS DRY ASH ON CALCIUM

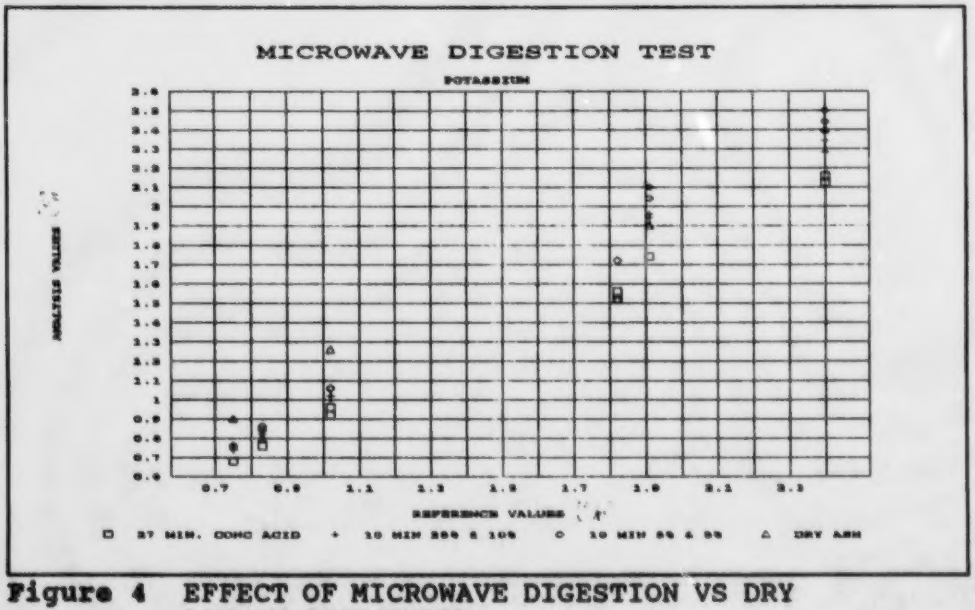

Figure 4 EFFECT OF MICROWAVE DIGESTION VS DRY ASH ON POTASSIUM

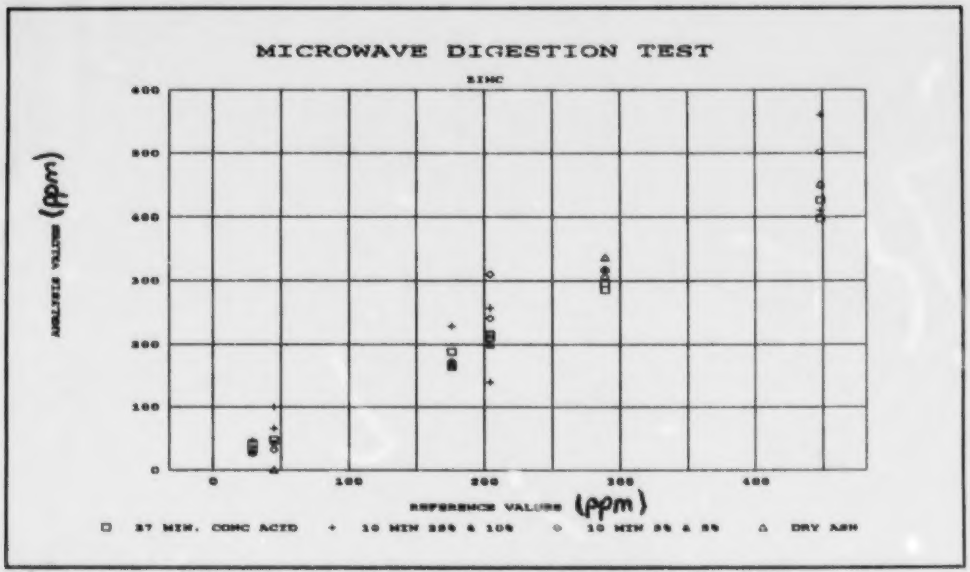

Figure 5 EFFECT OF MICROWAVE DIGESTION VS DRY ASH ON ZINC

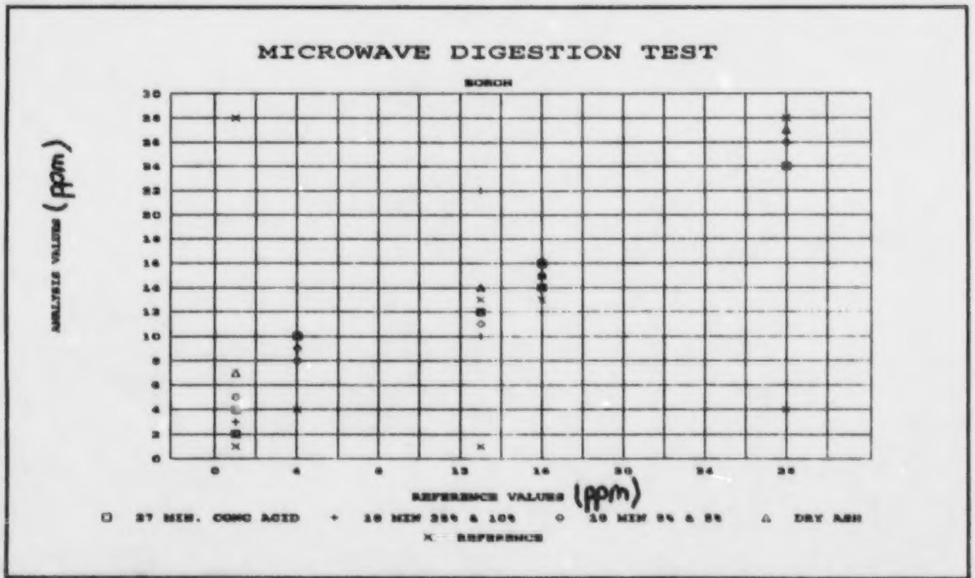

Figure 6 EFFECT OF MICROWAVE DIGESTION VS DRY ASH ON BORON

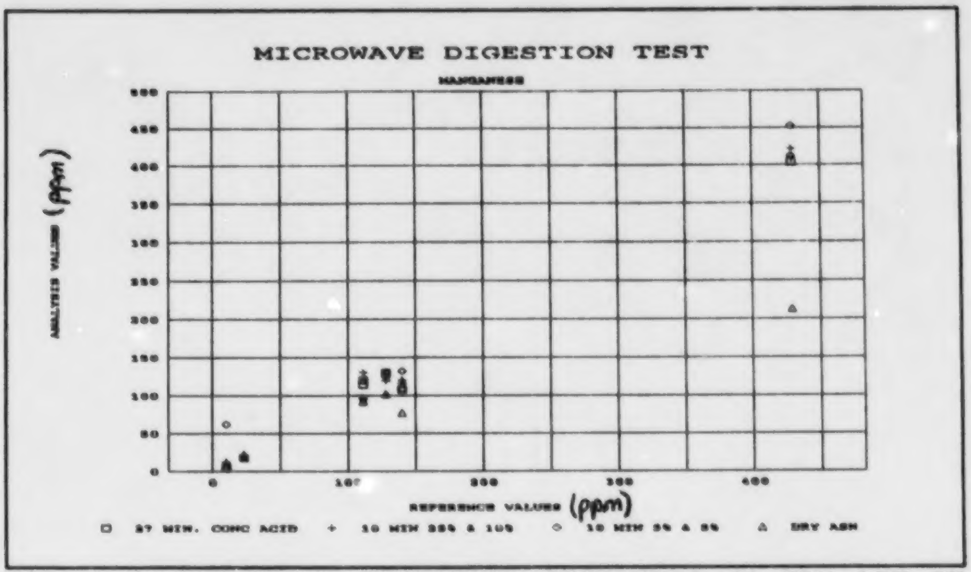

Figure 7 EFFECT OF MICROWAVE DIGESTION VS DRY ASH ON MANGANESE

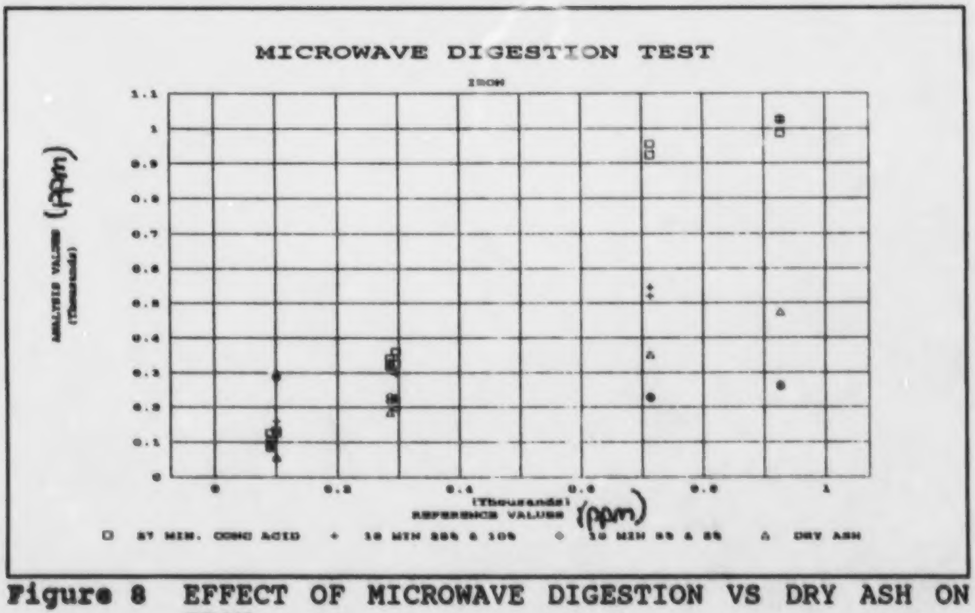

Figure 8 EFFECT OF MICROWAVE DIGESTION VS DRY ASH ON IRON

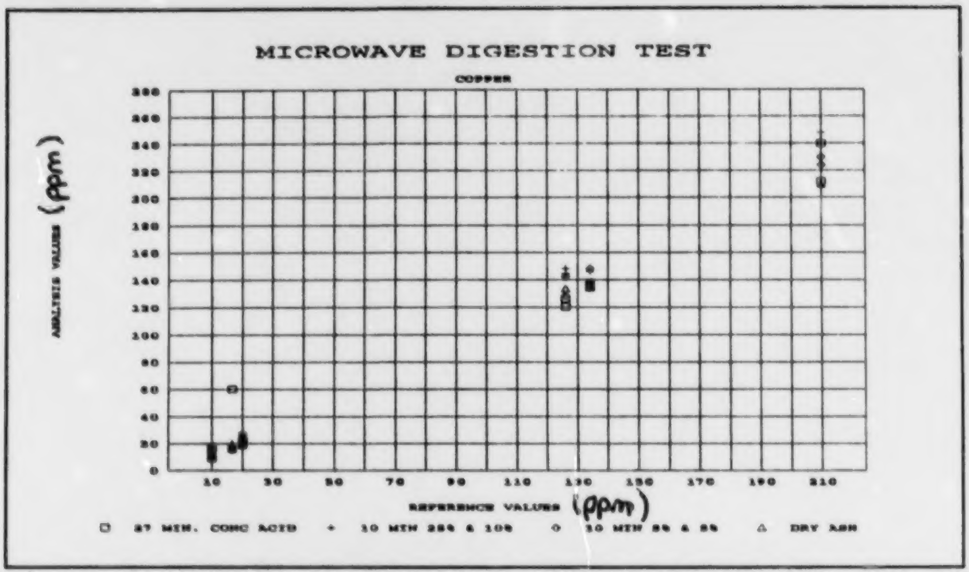

Figure 9 EFFECT OF MICROWAVE DIGESTION VS DRY ASH ON COPPER

EVALUATION OF TRANSPORTATION SYSTEMS FOR LARGE ROUND BALES

C. F. Everett & D. Colwell

Engineering Section, Land Resources Branch

Abstract: Project LT 2066 consisted of the performance evaluation of a self-loading round bale transporter. The objective was to evaluate and demonstrate transportation systems that were capable of safely handling large round bales on New Brunswick highways. A Pronovost Transporter was used in the on-farm tests conducted. Tests were realized in dry hay only.

ÉVALUATION DES SYSTÈMES DE TRANSPORT DE GRANDES BALLES RONDES

C.F. Everett et D. Colwell

Section du génie, Direction des ressources des terres agricoles

RÉSUMÉ : Le projet LT 2066 portait sur l'évaluation de l'efficacité d'un transporteur autochargeur de balles rondes. Il s'agissait d'évaluer et de faire connaître des systèmes capables de transporter sans danger les grandes balles rondes sur les routes du Nouveau-Brunswick. On a utilisé un transporteur Pronovost pour les essais en plein champ seulement en ce qui concerne le transport de balles de blé.

INTRODUCTION: The transportation system evaluated was a Pronovost Round Bale Transporter. This transporter was a single row, self-loading wagon having a deck length of 28 feet. The model was P 6800 with stacking and ensiling capabilities. The unit was demonstrated on seven New Brunswick dairy and beef farms. Funding was provided by the Canada/New Brunswick Livestock Feed Development Agreement.

METHODOLOGY: The Pronovost Round Bale Transporter was used on seven commercial farms. The farms involved were both dairy and beef operations in the Western Region. Trials were conducted mostly with dry hay. Time and motion studies were performed where conditions permitted. Additional data was collected by the individual producers involved. A cost analysis was performed using computer software. Video footage was recorded.

RESULTS AND DISCUSSION: The Pronovost Model P6800 Round Bale Transporter used was a single row, self loading bale wagon. Loading was done by means of an arm (Photo P-1) raised and lowered by means of a hydraulic cylinder. After loading, bales were moved toward the back by hydraulic ram (Photo P-2). The hydraulic valve bank was controlled from the tractor by means of attached cables (Photo P-3). Unloading was performed by means of a dump system. The subframe was hydraulically raised, bales slid downward, the tractor moved forward, and bales left in a uniform line. An optional unloading method was stacking bales three high. With this method, the subframe splits and stands the bales on end. Two types of bale forks were supplied with the unit. An additional option of an incorporated silage bagger was not purchased. Specifications of the unit, are shown in Appendix I.

Overall hitching adjustment capabilities were good. This drawbar type hook up had a swivel tongue mounted on an adjustable plate. The plate had three settings. The heavy duty implement jack hinged upward and pinned for transporting.

The transporter loading arm was raised and lowered by a hydraulic cylinder. A video supplied by the manufacturer recommended approaching bales from the same direction of travel as the baler, and turning the bales with the extension on the outside arm. The method preferred by all local producers involved in this project was approaching the flat side of the bale (cross-field in most cases). Growers further stated that up and down direction of field travel could be achieved by backing the baler at 90° when discharging the bale from the chamber. Growers further stated that ease of loading was affected by the length of time bales were left in the field (settling). The arm unit was adjustable to individual preferred bale size.

Once bales were loaded onto the deck of the transporter, a hydraulic ram pushed them toward the back (one width). On slightly sloped ground, a problem was incurred with loaded hay moving toward the front of the unit and interfering with loading. Gusset or fishback shaped stops were added (Photo P-4). This modification is not applicable for wrapped or bagged silage bales. The average load for all testing conditions was 6 bales, 5 ft x 5 ft in size.

When transporting on a public highway, the loading arm would be in the fully raised position and pinned (Photo P-5). Extra bales should not be carried in the lift arm. Maximum ground speeds and minimum tractor size should be as per manufacturers recommendations. Individual producers involved in this project agree that a minimum size of tractor for use with this unit should be 80 horsepower. Since brakes are not standard on this transporter, adequate caution should be taken to allow for stopping. A high grade safety should be used to hitch the unit to the tractor. Also, a slow moving vehicle sign and bracket (Photo P-6) must be added to the unit before using. Care should be taken to avoid damage to the hydraulic bank when making sharp turns (Photo P-7).

Unloading performance was good. The transporter was backed or driven into the desired unloading area, the dump raised, the tractor moved forward, and the bales slid off in a uniform line. There was minimal damage to bales as a result of unloading. The stacking option was not used in this series of tests due to storage methods used in the Western Region. After measuring the distance from the deck front to the divide for the stacking option (13 feet), it was obvious that this unit was designed to stack four foot bales three high. Other sizes could be stacked with slightly more handling of the product.

Work rates varied by farm due to bale size, number hauled per load, distance hauled, and topography. Time and motion studies conducted showed that with minimal slopes, uniform bales, and operator familiarity with the transporter, the unit could be loaded with 6 bales in less than 3 1/2 minutes (minimum). Dump time was consistently less than 1/2 minute with uniform results. For a 3 mile round trip travel distance, 15 bales (average 6 per load) can be hauled in one hour. As distance increased, work rate decreased.

The safe operation of units such as the Pronovost Transporter was an important consideration. The overall performance was good, however, a slow moving vehicle sign/bracket and safety chain were added before the unit could be used on a public highway. Only 2 bales out of 600 were lost off the deck. One lost bale was caused by carrying it in the back fork extensions up a steep slope. Another loss was caused by too many large width bales in proportion to total deck length. The deck was flexible to various bale diameters, but producers with sloped ground indicated that they would prefer adjustable deck rails. Cradling the bales in the deck rails was the method used to keep them on the transporter. When loading heavier silage, counter balance weights must be used (Photo P-8). Since the unit tested was the single row type, overall transporting visibility was fair to good. Tractor counter balance should be specified by the manufacturer.

Overall reliability was fair. The loading arm and frame cross beam supporting the loading cylinder both failed (Photo P-9) after loading only a few bales. The arm was reinforced and the cross beam replaced with a heavier wall H.S.S. and gussets added (Photo P-10). The only other failure was a cast iron hydraulic fitting on the control bank.

Controls used on this unit utilized cables from the tractor to the transporter valve bank. These controls were cumbersome, difficult to mount on tractors, and limited distance of the valve bank to the tractor.

An operators manual was not available at time of testing, but a promotion type video was provided. However, after inquiring with the manufacturer, an operators manual was in the process of publication.

CONCLUSIONS: The Pronovost P 6800 round bale transporter is a safer means of transporting dry hay than some methods currently being used in New Brunswick. The bales are not fastened to the deck of the unit, but are cradled in deck rails. Bales remained in their place during field and road testing.

From an economical stand point, distance of travel and number of bales transported are major considerations before selecting a system.

Since this transporter was evaluated mostly in dry hay, further testing in silage should be conducted during the 1992 season.

RECOMMENDATIONS:

1. The hydraulic valve bank should be relocated so that they cannot be damaged by tractor lower lift arms.
2. Controls should be electronics over hydraulics with a magnetic mounting bracket.
3. Lift arm should be reinforced.
4. The cross bracing for the lift arm cylinder mounted on the transporter frame should be upgraded.
5. Tractor counter ballast should be added as per manufacturers recommendations.
6. The unit should be further demonstrated in round bale silage.
7. The stacking option requires evaluation.

REFERENCES: Yves Plourde, Marketing Manager, Les Machineries Pronovost Inc., 260, Route 159, St-Tite, Quebec

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Specifications:

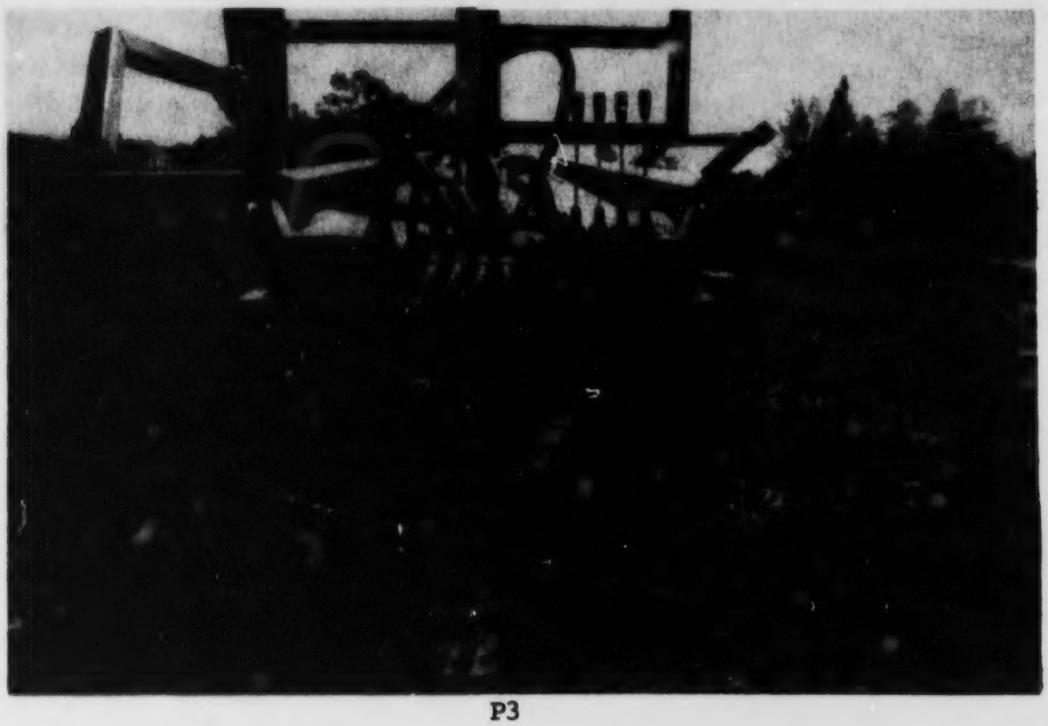
Pronovost P 6800 Round Bale Transporter

Overall Length	32 feet
Effective Deck Length	28 feet
Overall Width	7 feet 6 inches
Distance from ram to edge of stacking section	13 feet
Maximum height	13 feet
Loading arm	Hydraulic cylinder
Dumping system	Hydraulic cylinder
Tires	4 @ 11 L - 155 L, 8 ply implement
Lights	Not available
Brakes	Not available
Hitch type	Drawbar
Hitch weight	1240 lb (measured)
Implement jack	Heavy duty
Jack weight	1460 lb (measured)
Total weight	3800 lb (manufacturers rating)
Lifting capacity	2500 lb (manufacturers rating)
Maximum weight	14,000 lb (manufacturers rating)

Figure F-1

P1

P2



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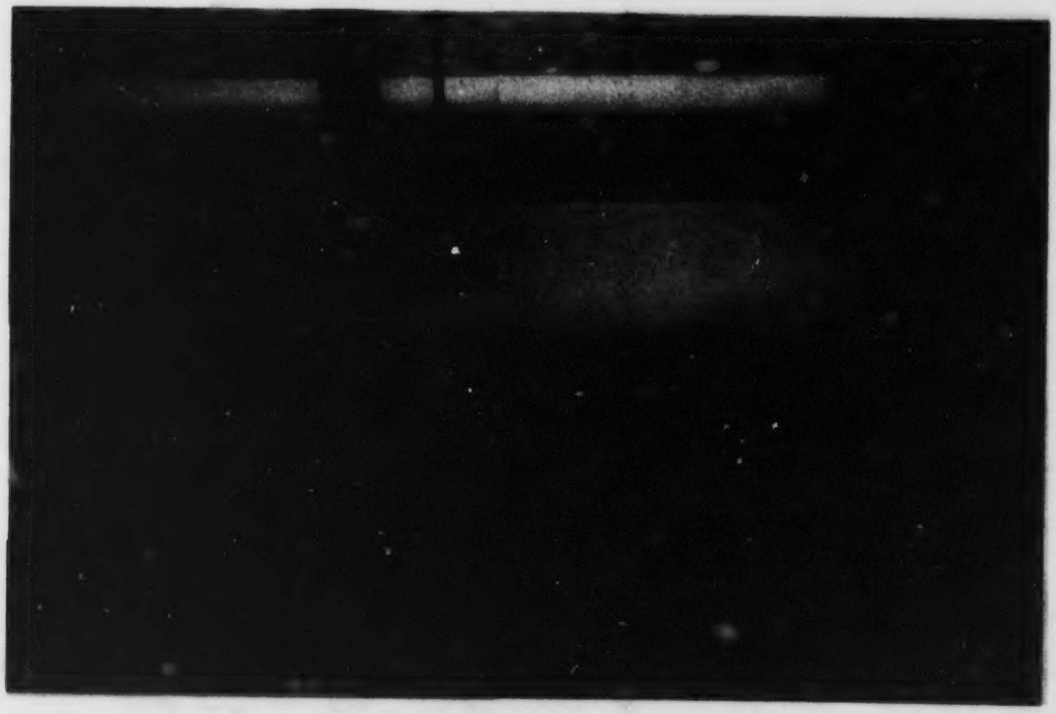

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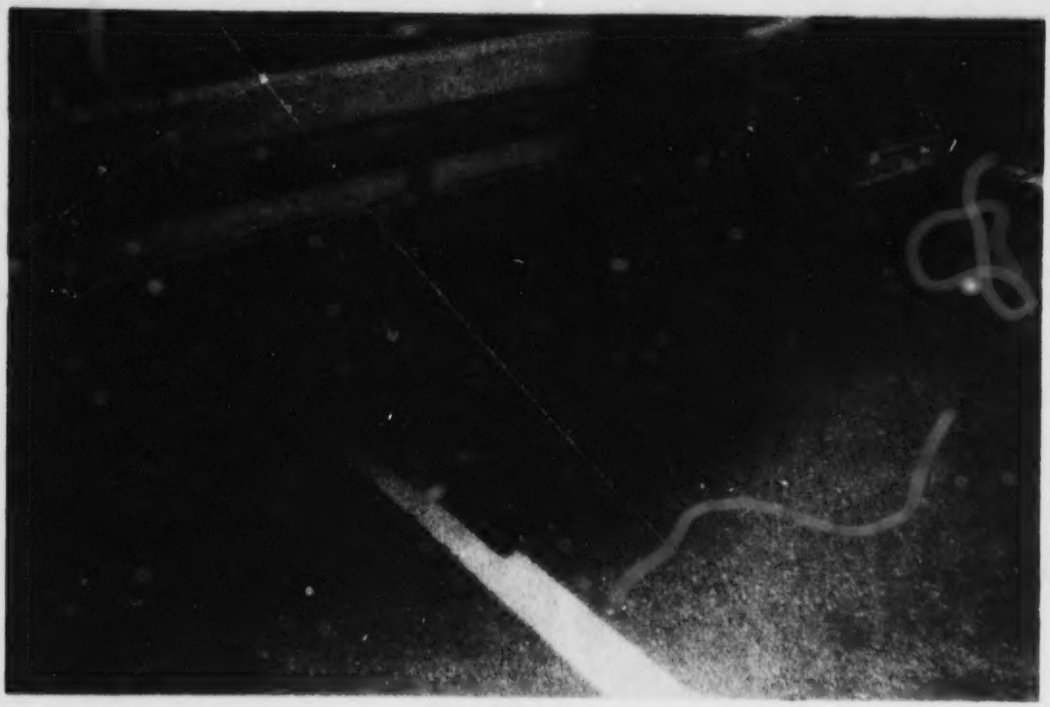

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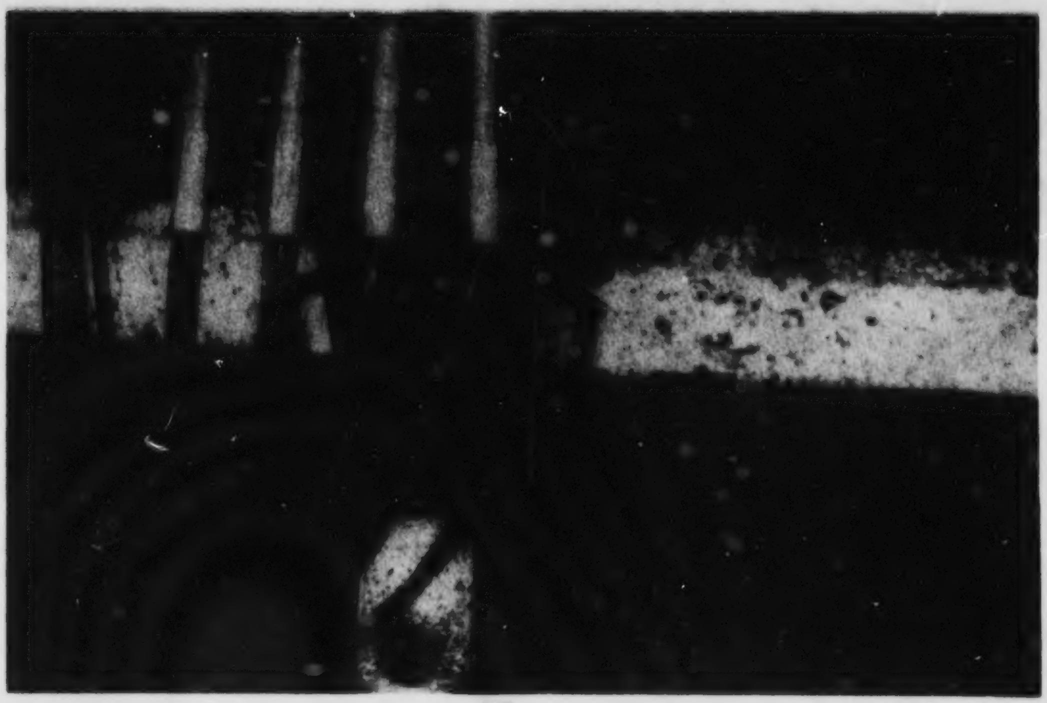

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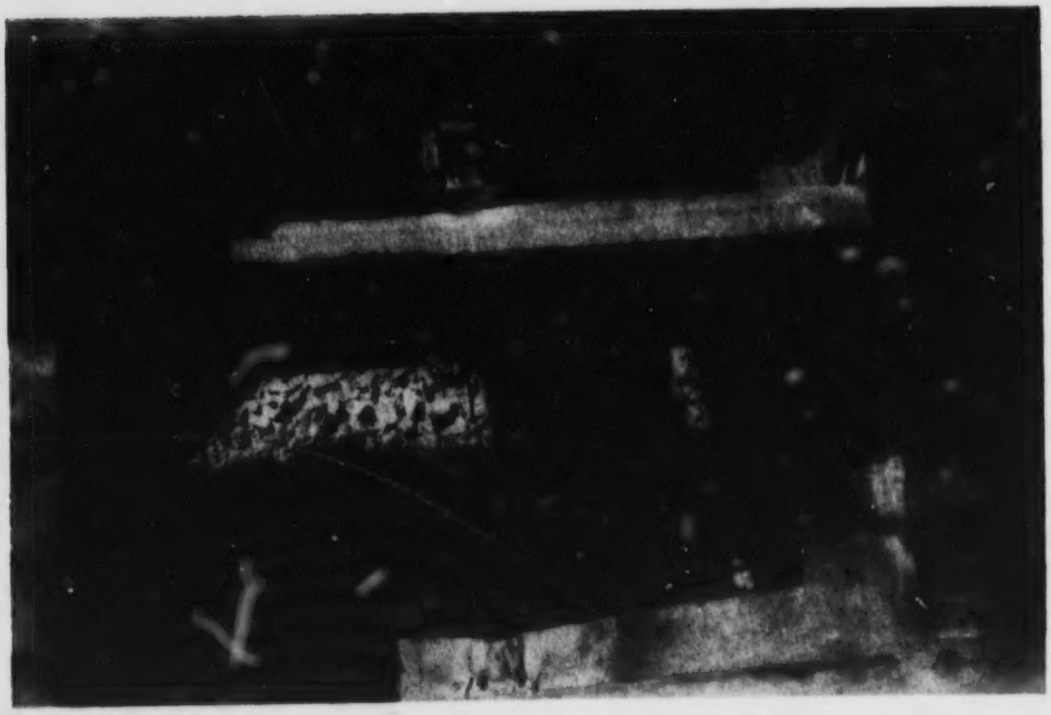

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FRUIT/FRUITS

RASPBERRY VARIETY TRIAL

Roger Tremblay and Carolyn Hollis

ABSTRACT: A trial was established in 1984 to evaluate and compare eight different cultivars of raspberries on winter survival and fruit yield. The cultivars Festival, Heritage and Boyne displayed good winter survival. Gatineau proved to be a poor cultivar for New Brunswick's climate. There was no information available on the winter survivability of the Nova cultivar. The cultivars Boyne, Nova and Festival produced the best yields. The trial was wrapped up in 1991 due to poor production and vigour overall. Upon observation, it was found that the cultivars Gatineau, K65-12 and U.S. Latham showed a high prevalence of mosaic virus symptoms. Four cultivars were tested for various types of fungi associated with raspberry root rot, using Agri-Diagnostics Multiwell Immunoassay kits. Three of the four tested positive for Pythium C. A total of up to 12,270 root lesion nematodes were found per kilogram of soil.

ESSAI DE VARIÉTÉS DE FRAMBOISES

RÉSUMÉ: On a entrepris en 1984 un programme d'essais afin d'évaluer la survie hiémale et le rendement de huit différents cultivars de framboises. Les framboisiers Festival, Heritage et Boyne ont bien survécu à l'hiver. Le framboisier Gatineau est mal adapté au climat du Nouveau-Brunswick. Les framboisiers Boyne, Nova et Festival ont donné les meilleurs rendements. En 1991, on a mis fin au programme en raison d'un mauvais rendement et d'une vigueur médiocre de l'ensemble des framboisiers. On a constaté chez les framboisiers Gatineau, K65-12 et U.S. Latham un taux élevé de symptômes du virus de la mosaïque. Au moyen des trousses d'immuno-essai Agri-Diagnostics Multiwell, on a fait passer à quatre cultivars les tests pour divers types de champignons liés au pourridié des racines du framboisier. On a trouvé du Pithium C. sur trois des quatre cultivars. On a compté au total 12 270 nématodes des racines dans un kilogramme de sol.

SUMMARY: 1991 marked the final year of the raspberry variety trial at the New Brunswick Horticultural Centre in Hoyt, due to poor plant vigour and poor production overall. The trial was originally established in 1984 in order to evaluate and compare eight different cultivars of raspberries on the basis of berry yield and winter survival. The cultivars tested were: Boyne, Comet, Festival, Gatineau, Heritage, K65-12, Nova, and U.S. Latham.

No harvest or winter injury data were collected this year, although results from the spring of 1990 showed that the cultivars Festival, Heritage and Boyne had the best winter survival, while the Gatineau had a lot of cold stress injury. No information was collected on winter injury to the Nova cultivar. The best yields were harvested from the cultivars Boyne, Nova and Festival.

In an attempt to determine what caused the decline in the stand's health, the cultivars were evaluated for symptoms of the raspberry mosaic virus, a disease transmitted by aphids which is characterized in early summer by random patches of yellow and green on the leaves (Fig. 1). Each of the four replications of each cultivar were inspected and rated as positive, negative or questionable for symptoms of the virus (Table 1). One of the reps of K65-12 could not be evaluated due to extremely poor growth. The cultivars Gatineau, K65-12 and U.S. Latham showed the greatest prevalence of raspberry mosaic virus symptoms (100%, 75%, and 75% respectively). No positive symptoms

TABLE 1: Symptoms of mosaic virus in various raspberry cultivars

CULTIVAR	P	?	N	CULTIVAR	P	?	N
Boyne	25%	0	75%	Heritage	0	25%	75%
Comet	50%	0	50%	K65-12	75%	0	0
Festival	0	25%	75%	Nova	0	50%	50%
Gatineau	100%	0	0	U.S.Latham	75%	25%	0

P = POSITIVE ? = QUESTIONABLE N = NEGATIVE

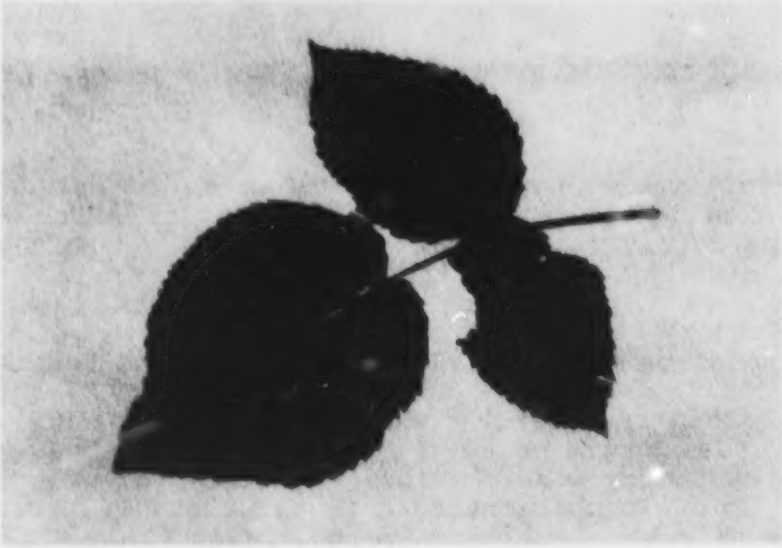

FIGURE 1: RASPBERRY LEAF SHOWING CHARACTERISTIC SYMPTOMS OF MOSAIC VIRUS

were found in the Festival, Heritage and Nova cultivars.

Four cultivars - Gatineau, Nova, Festival and K65-12 - were also tested for *Pythium* C, *Phytophthora* D and *Rhizoctonia*, three types of fungi associated with root rot in raspberries. These tests were carried out using Agri-Diagnostics Multiwell Immunoassay kits. All results were negative for both *Phytophthora* and *Rhizoctonia*, while all of the above cultivars except Festival tested slightly positive for *Pythium*.

Harmful nematodes were also evaluated. The root lesion nematodes ranged from 1,500 to 12,720 per kilogram of soil, differing for interrow and row samples. A range of 31 to 583 root lesion nematodes per gram of roots were identified. The threshold for the root lesion nematodes is 500 per kg of soil and/or 50 per gram of roots.
The sandy soil at the Horticultural Centre has been partly blamed for the poor production and vigour of the stand, as a loamier soil type is generally recommended for raspberries. On the whole the Boynes and Festivals have been the hardiest, best-producing cultivars in this trial.

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1991 INTEGRATED PEST MANAGEMENT PROGRAM FOR STRAWBERRIES

Roger Tremblay, Carolyn Hollis

ABSTRACT: The Integrated Pest Management Program for strawberries which was established in 1990 was continued in 1991, with only three of the original nine farms being fully scouted. Problems identified included the clipper weevil, tarnished plant bug, aphids, thrips, various nematode species, weeds and leaf diseases. The two-spotted spider mite was monitored closely throughout the growing season. The program was successful in identifying the problems, and recommending the proper control measures in time to be effective.

PROGRAMME INTÉGRÉ DE LUTTE ANTIPARASITAIRE EN 1991 DANS LES FRAISERAIES

RÉSUMÉ: On a poursuivi en 1991 le Programme de lutte intégrée contre les ennemis des cultures de fraises lancé en 1990, mais on a seulement observé les cultures dans trois des neuf exploitations qui participaient auparavant au programme. Parmi les ennemis repérés, on trouve l'anthonome de la fleur du fraisier, la punaise grise, les pucerons, les thrips, diverses espèces de nématodes, les mauvaises herbes et les maladies des feuilles. On a observé de près la tétranyque à deux points durant toute la saison de croissance. Le programme a donné de bons résultats pour ce qui est de cerner les problèmes et de recommander des mesures de lutte efficaces au moment opportun.

INTRODUCTION: When this program was established in 1990, its goal was to identify the major problems facing New Brunswick strawberry growers. The main objectives of the program in its first year were to establish pest threshold levels or to update existing thresholds; to educate strawberry growers on proper pest (weed, insect and disease) identification and control; and to identify the program's positive and negative aspects in order to improve upon it for 1991.

In 1991 the objectives were much the same with the exception that the farm visits were made more frequently, by decreasing the number of farms scouted from nine to three. This allowed efforts to be more concentrated on pest identification and for more problems to be identified before it was too late for control measures to be taken.

DESCRIPTION OF PROCEDURE: Three of the nine strawberry farms scouted in 1990 were selected to be scouted in 1991. These farms, covering approximately 21.5 acres in total, were selected on the basis of their distance from the Fredericton Research Station, as travelling time is a major cost factor. The farms were visited once every 5-8 days from late May to early September. Procedures were carried out as follows:

(SEE NEXT PAGE)

May/Early June:

- Updated farm maps which had been developed in 1990, indicating field locations, cultivars and ages of fields.

- Took soil samples for regular soil analysis (see LABORATORY ANALYSIS PROCEDURES). A special analysis for soil boron content was carried out, as a boron deficiency can lead to excessive fruit deformity.

- Frost injury to blossoms was evaluated at two of the farms scouted.

- Water samples were taken from one of the farms.

June:

- Leaf samples were taken for nutrient analysis as well as for determining the level of two-spotted spider mite populations. The growers whose farms were scouted in 1990 but not in 1991 were also asked to send in leaf samples for nutrient analysis.

- Fields were checked for the presence of various pests, including tarnished plant bug, spittlebug, aphids, and any leaf diseases. Weeds occurring in heavy populations were identified in order that the proper herbicides could be recommended.

- Additional soil samples were collected for regular soil analysis.

July:

- Berries were harvested from random sections in each field to evaluate the level of fruit rot.

- Leaf samples were taken for two-spotted spider mite analysis.

August:

- Leaf samples were taken for two-spotted spider mite analysis.

September:

- Soil samples were taken for nematode analysis as well as regular laboratory analysis as indicated in May/June procedures.

- Leaf samples were taken for two-spotted spider mite analysis.

FIELD TECHNIQUES USED TO IDENTIFY VARIOUS PROBLEMS:

Frost Injury: Strawberry blossoms which have been injured by frost are marked by a blackened pistil, the central part of the flower which is normally bright yellow[1]. In order to determine the extent of frost injury to the blossoms in late May, three randomly-chosen 1 metre x 0.5 metre row sections were staked out. The number of frost-injured flowers were counted, then compared to the total number of flowers in that section to give a percentage injury value.

Soil and Leaf Sampling: All soil samples were taken using a metal soil probe at random locations in the field. For nematode analysis the soil was sampled as close to the roots as possible, without damaging the plants, and the roots of six plants were included with the soil in each sample.

Leaf samples were also taken randomly over the whole field or cultivar. Each sample consisted of 100 leaves when nutrient analysis was necessary, while just 50 leaves were picked when only the two-spotted spider mites were being checked.

Plantations differing in cultivar, age, and/or geographic location were sampled separately.

Other Pests: Random checks were made in the field for the presence of tarnished plant bug, aphids, spittlebug, thrips, and leaf diseases.

Fruit Rot Analysis: Randomly-chosen 1m x 0.5m row sections were again staked out in each field or each cultivar within a field, and all of the berries within the stakes were harvested. The weight of rotten berries was then compared to the total weight in order to get a percentage fruit rot.

NOTE:
Strawberry Clipper Weevil: This insect reduces berry production by clipping the blossoms' petioles just below the sepals[1], causing the blossoms to fall to the ground. Since it is very difficult to detect the clipper weevil before the damage is done, growers were recommended to apply a preventative spray in 1991.

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[1] *See 'Frost Injury on New Brunswick Strawberries' by R.Trembley and C.Hollis, Adaptive Research Reports, N.B.D.A. Vol.13, 1991. Figure 1.*

LABORATORY ANALYSIS PROCEDURES:

Regular Soil Analysis: Soils were analyzed as follows:

1) Mechanical Analysis - indicates the percentage of silt, clay and sand present in the sample. This is very important in making proper herbicide recommendations.

2) Organic Matter - gives the percentage of the soil which is made up of organic matter.

3) pH - indicates the acidity/alkalinity of the soil. This is also important in making herbicide recommendations.

4) Fertility - gives a breakdown of the amounts of phosphate, potash, calcium and magnesium in the soil.

Leaf Nutrient Analysis: Provides a breakdown of the amounts of nitrogen, calcium, magnesium, phosphorus, potassium, boron, copper, iron, manganese and zinc in the leaves. Deficiencies could indicate either a lack of that nutrient in the soil, or a problem with uptake of the nutrient by the plants.

Water Analysis: Water samples which were collected from one farm were analyzed for all of the nutrients indicated under "Leaf Nutrient Analysis", and the pH level was also measured. This analysis was important, as the ponds sampled were being used for pesticide applications.

Two-Spotted Spider Mite Analysis: The three leaflets from each leaf in the sample were separated. Each leaflet was then run through a mechanical roller which brushed the insects and their eggs off the leaflet, and dropped them onto a greased glass plate below the rollers. This plate was then observed under a microscope and the number of mites and eggs were counted.

Nematode Analysis: All of the farms which were originally scouted in 1990 were sampled for nematode analyses. Soil samples were shipped to the Agriculture Canada Research Station in Vineland, Ontario to be analyzed for nematodes. The lab was able to identify the species of nematodes present in the sample, as well as the population size. For two species - root lesion[2] and root knot - a separate analysis was performed on the roots contained in the soil sample.

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[2] *root lesion nematode - Pratylenchus spp.; root knot nematode - Meloidogyne hapla.*

PROGRAM EVALUATION: Through this program, we succeeded in identifying the major pests interfering with strawberry production in New Brunswick fields. By scouting the farms more frequently, we were able to recommend proper control measures before too much damage was incurred.

Most of the efforts in 1991 were concentrated on monitoring the two-spotted spider mite, as this was found in high numbers at all three farms. It was encouraging to see the drop in population sizes from sometimes greater than ten times the threshold, to almost nothing following insecticide applications. However, because the insecticides had no lethal effects on the mite eggs, the population sizes would fluctuate as each generation of eggs became adult mites. Because of this growers had to apply insecticides several times before and after the harvest season.

The nematode analyses revealed a major problem with root lesion nematodes in New Brunswick. This is the most injurious nematode species in strawberry plantations, and because more damage is being inflicted by smaller population sizes, the threshold level for the root lesion nematode was dropped in 1991 from 1000 nematodes per kilogram of soil, to 500. For more information on the nematode analyses, see "Strawberry Nematodes in New Brunswick" by R.Tremblay and C.Hollis, Adaptive Research Reports, N.B.D.A. Volume 13, 1991.

Most of the changes which were recommended following the 1990 program were made in 1991. However, there were a few areas which could be improved upon as well as some ideas for new changes to be made in the 1992 program:

- Updating the farm maps: where there is more than one cultivar in a given field, the number of rows of each cultivar should be indicated and the cultivars listed in the order that they exist in the field. This is essential if separate soil and/or leaf samples are to be taken from each cultivar in the field.

- A general schedule for the scout to follow should be established in early May, indicating the type of sampling or testing to be done each week until the end of August. This would allow the scout to be better organized and ensure that all of the tests are being carried out on time. A better system for getting the results back to the grower should be established.

- Forms should be made for filling in information on each field, such as pesticide and fertilizer applications and/or problems noticed by the grower or by the scout during the visit. These forms would be taken with the scout on each visit, and would prevent important information from being left out.

CONCLUSIONS: The 1991 Integrated Pest Management Program was successful in its goals of identifying major problems facing New Brunswick strawberry growers, and to do so in time for control measures to be taken. Costs were reduced in 1991, and the frequency of visits increased, by cutting down on the number of farms scouted.

The program will be continued in 1992, with this year's emphasis being placed on monitoring the tarnished plant bug. As well, in order that more growers may benefit from the program, at least two workshops will be held in the spring of 1992 for strawberry producers to learn more about insect and disease identification.

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EFFECT OF WINDBREAK ON STRAWBERRY PRODUCTION

R. Tremblay, G. Read, C. Hollis

ABSTRACT: In June of 1990 a trial was established in Belleisle Creek, New Brunswick to test the effects of artificial windbreaks on strawberry production. In 1990, the planting year, there were 48% more runners produced in the windbreak areas than in the open areas, while harvests in 1991 showed that the yield from the windbreak areas exceeded that from the open areas by 28%. Windspeeds in both the sheltered and the open areas were monitored using totalizing anemometers, indicating that the average windspeed in the open areas exceeded that in the protected areas by 47% in 1990 and by 49% in 1991.

EFFET DE BRISE-VENT SUR LA PRODUCTION DE FRAISES

RÉSUMÉ: On a établi en juin 1990 un programme d'essai à Belleisle Creek, au Nouveau-Brunswick, afin d'évaluer les effets de brise-vent artificiels sur la production de fraises. En 1990, l'année de la plantation, on a constaté une production supérieure de stolons de 48 % dans les secteurs protégés par des brise-vent en comparaison avec la production dans les secteurs non protégés. En 1991, le rendement des secteurs protégés dépassait de 28 % celui des secteurs non protégés. On a mesuré la vitesse du vent au moyen d'anémomètres totalisateurs et constaté que la vitesse moyenne du vent était supérieure dans les secteurs non protégés à celle dans les secteurs protégés dans une proportion de 47 % en 1990 et de 49 % en 1991.

INTRODUCTION: Prompted by the previous success of artificial windbreaks on New Brunswick apple trees and some vegetable crops, the potential for windbreak usage in berry crops was tested in a New Brunswick strawberry field. Windspeed was monitored, and the effect of the artificial windbreak on strawberry production was determined by measuring runner formation, crop quality and yield. It is believed that windbreak structures increase crop production in general by increasing pollination, improving soil moisture, increasing heat and CO_2 levels, and decreasing physical damage to the plants.

MATERIALS & METHODS: Three windbreaks were constructed along the rows of a new Veestar plantation in June of 1990, using a woven black polypropylene with 50% porosity. The windbreaks, labelled "Treatment 1", were 1.8m high and approximately 10m wide. An open area, labelled "Treatment 2", followed each windbreak structure. This open area was wider than the windbreaks because the areas flanking each end of the structures were subject to the "edge effect" - turbulence caused by air hitting the ends of the structures. No data was collected from this area. The three windbreaks and the open areas following each gave three replications of each treatment.

A totalizing anemometer was installed in one rep of each treatment in order to measure and compare the wind velocities in each 1990 and 1991. Runner counts were carried out in the fall of 1990.

In 1991 after tightening the windbreaks (which remained standing throughout the winter), three one-metre sections ("plots") were chosen randomly between the second and ninth row of each rep and treatment. These plots were staked and roped in, and between June 27 and July 22 all berries from each of these eighteen plots were harvested, weighed and counted, giving the results shown in Table 1.

RESULTS & DISCUSSION:

NOTE: This trial could not be analyzed as a completely randomized block design (CRBD) since the placement of the two treatments was not random. Therefore, for statistical calculations, each 1m x 0.5m harvesting plot was considered to be one replication, and analysis of variance at the 0.05 level was carried out for a completely randomized design with nine replications.

TABLE 1: Differences in Production

TREATMENT	1990		1991	
	AVERAGE # RUNNERS	AVERAGE WINDSPEED	TOTAL YIELD (GMS)	AVERAGE WINDSPEED
T1-WINDBREAK	35.5	4.88 KM/H	12,737	3.88 KM/H
T2-NO WINDBREAK	24.0	7.17 KM/H	9924	5.77 KM/H
% DIFFERENCE	47.9%	46.9%	28.3%	48.7%

1) **Runner Production:** 1990 results showed significant differences in runner production between the sheltered and the open areas. Although the difference was reported in 1990 Adaptive Research Reports to be 40%, recalculations showed that there were actually 48% more runners in the windbreak areas.

2) **Total Berry Yield and Quality:** When the harvests from the three reps were averaged together for each treatment, the sheltered plants consistently produced higher yields for each picking date, with a difference as great as 150% on July 22. Although the difference in total yield between the two treatments was found to be statistically insignificant, there was a 28% greater yield from the windbreak areas than from the open areas. The lack of significance was probably due to the large amount of variance within each treatment.

Since the average weight per berry was virtually the same for both treatments (4.54 grams), the heavier yield in the protected areas had to be due to a higher number of berries being produced by those plants. There was no difference in the amount of deformed berries between the two treatments overall. In a similar trial on the Cambridge Favorite cultivar, Waister (1972) also found no differences in berry weight or malformation.

3) **Windspeed:** Although the anemometers were only in place for 43 days in the fall of 1990, the average windspeed in the open areas was found to exceed that in

the sheltered areas by 47%. In 1991 the average windspeed was calculated over 148 days and was found to be 49% higher in the open areas.

It has been speculated that decreased windspeed can be disadvantageous by increasing pest insect populations in the sheltered areas. A count of two-spotted spider mites in mid-late June of 1991 showed no differences between the two treatments. As long as the proper control measures are taken this should not cause a problem.

CONCLUSIONS: The differences in production seen here are probably due to a reduction in physical stress on the plants in the sheltered areas, although other factors could be involved such as increased pollination, improved soil moisture, and greater heat and CO_2 levels. Berry production in the sheltered areas, although not considered to be significantly higher, exceeded that in the open areas by almost 30%. There was a lot of variation between each harvesting plot, and this probably caused the lack of significantly different yields between the two treatments.

The results justify continuation of this trial in 1992, when more harvest and windspeed data will be collected.

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SUMMARY OF SMALL FRUIT TRIALS IN NEW BRUNSWICK

Roger Tremblay, Carolyn Hollis

INTRODUCTION: This summary will bring you up-to-date on the following small fruit trials: Renovation Practices for Strawberries, Gooseberry Trellising Trial, Hardy Kiwi Trellis Trial, Dessert Grapes Trial, A Survey of New Brunswick Raspberry Plantations, and the 1991 Fall Row Cover Trial.

SYNTHÈSE DES ESSAIS SUR LES PETITS FRUITS AU NOUVEAU-BRUNSWICK

INTRODUCTION: La synthèse présente les derniers résultats des essais suivants : Pratiques de rénovation pour les fraisiers, Essai de tuteurage des groseilliers, Essai de tuteurage des kiwis robustes, Essai des raisins de table, Sondage auprès des producteurs de framboises au Nouveau-Brunswick et Essai de paillis sur les rangs à l'automne 1991.

RENOVATION PRACTICES FOR STRAWBERRIES: New Brunswick strawberry growers are presently recommended to do post-harvest mowing and narrowing (renovation) on all cultivars. Defoliation, achieved by mowing the plants, is thought to help control leaf diseases as well as remove an inhibitor of flower formation which is produced by older leaves. Tilling results in narrowing the rows to decrease plant density and thus competition, as well as pruning the roots and mounding the soil around the crowns (Chandler et. al., 1988). However, studies have shown that increases in production are not induced by renovation in all cultivars, and that the timing and type of renovation are very important factors to those cultivars which do benefit from the practice.

Full renovation (both mowing and narrowing) has been shown to reduce yield and even promote death of plants, probably due to the removal of food reserves in the foliage (Chandler et. al., 1988). Additionally, defoliation-only has the greater effect on plant growth than narrowing-only (Ibid). Since the strawberries produced in any given year originate from the overwintering fruit trusses (small, compact flowers) produced the previous autumn, the timing of the defoliation is critical to crop yield. As reported by Guttridge et al. (1960) in experiments with three Scottish cultivars, early defoliation can as much as triple the yield of quality fruit while delayed mowing either had no effect on or decreased the yield. As well, partial defoliation was shown to be superior to complete leaf removal in increasing production, no matter when the renovation was carried out (Guttridge and Mason, 1965).

A trial was established at the New Brunswick Horticultural Center in Hoyt in order to determine which renovation practice, if any, promotes the greatest crop yield and quality for New Brunswick growers. Two cultivars - Veestar and Blomidon - were planted in 1990 in a randomized split design with three replications.

Each rep consists of ten rows spaced 1.5 m apart, with ten plants in each row spaced 45 cm apart. Other than being fertilized with Triple-15 at the recommended rate, hand-weeded and covered with straw for the winter, the plants were left untreated until 1991. The insecticides Furadan and Thiodan were applied during the spring of 1991, as well as the fungicide Captan.

On June 26, 1991, one randomly-selected 1m x 0.5m plot was staked and roped in for each row and from June 26 to July 19 the berries from each of these plots were harvested, weighed, counted and evaluated on quality. This was carried out to insure that the reps were uniform in plant growth and berry production for each cultivar prior to being treated. When evaluated using ANOVA at the 0.05 level, the differences in total yield, overall average berry weight and deformity were found to be insignificant within each cultivar.

The treatments, randomly assigned to the rows for each rep, were as follows: **T1**-full renovation (fr) immediately after harvest; **T2**-fr two weeks after harvest; **T3**-fr five weeks after harvest; **T4**-narrowing of rows only (nar) immediately after harvest; **T5**-nar two weeks after harvest; **T6**-nar five weeks after harvest; **T7**-no renovation; **T8**-mowing only (mow) immediately after harvest; **T9**-mow two weeks after harvest; **T10**-mow five weeks after harvest. The renovation practices began on July 22 with T1, T4 and T8, followed on August 6 by T2, T5 and T9, and finally T3, T6 and T10 on August 26. The latter three treatments were originally to be carried out four weeks after harvest but had to be delayed to five due to wet conditions. On each of the three dates the newly-renovated plots were fertilized with Triple-15 at approximately 670 kg/ha (Nitrogen deficiency showed up in a tissue analysis taken in mid-July).

Due to a heavy population of creeping yellow cress as well as shepherd's purse, the herbicide Sinbar (80% WP) was applied to the entire plot on November 15, at a rate of 0.70 kg/ha. The plants were covered with a straw mulch in late November for overwintering. The first post-treatment harvest will be in 1992, when any effects of the renovation treatments should become apparent.

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Tremblay, R., J. "1990 Summary of Seven Small Fruit Crop Trials in New Brunswick". Adaptive Research Report. N.B.D.A. 1990. Vol.12. 33.

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GOOSEBERRY TRELLISING TRIAL: In the spring of 1990, six different varieties of gooseberries from the Netherlands were planted along a trellis system at the New Brunswick Horticultural Center in Hoyt. The cultivars were: Whinham's Industry, Rosko, Whitesmith, May Duke, Achilles and Careless. There was a total of 82 new plants at one-metre spacing.

Rust and powdery mildew were detected on some of the plants in both 1990 and 1991, and the currant sawfly was a problem in 1991. Although all of these factors cause reduced plant vigour, the damage inflicted by the sawfly larvae was the most noticeable with holes eaten through the leaves and generally poor-looking plants. The insecticide Diazinon 50EC seemed to help reduce the infestation, but a lot of foliar damage remained. Captan 50WP was applied in August of 1990 and garden sulphur throughout the summer of 1991 on an almost-weekly basis to combat the powdery mildew problem, however control was not achieved.

Winter injury evaluations in the spring of 1991 showed that Whitesmith had the best winter survival followed by May Duke, while the cultivars Rosko and Whinham's Industry showed the poorest survival. The plants were pruned into fan shapes in the spring of 1991 and fertilized with Triple-15 early in the summer.

This trial will be carried on next year, when many of the branches should grow long enough to be trained to the first wire of the trellis. A few of the plants produced berries this summer for the first time, however we would like to encourage more plant growth first.

References: Tremblay, R., J. Baker. "1990 Summary of Seven Small Fruit Crop Trials in New Brunswick". Adaptive Research Reports. N.B.D.A. 1990. Vol.12. 32.

HARDY KIWI TRELLIS TRIAL: Kiwifruits are normally warm-climate plants which cannot withstand temperatures below -12°C. However, there are two species - Actinidia kolomitka and Actinidia arguta - which have been found able to withstand temperatures more typical of New Brunswick's winter climate. These two species are presently being grown on the trellis system at the New Brunswick Horticultural Center in Hoyt, in order to test and compare their hardiness for our climate.

In May of 1989 eight different cultivars of female kiwis and a variety of male clones, all A. arguta, were planted and immediately fertilized with Triple-20. Winter survival was poor, however, with only seventeen of the thirty original plants remaining by October 1990. An inspection of the dead plants, all of which were female, showed that all had healthy root systems and no diseases. Those cultivars showing the poorest survival rate were Geneva and 70-62.

In mid-May of 1991, those plants which withstood the 1990 winter were pruned into fan shapes while the dead plants were removed and replaced with new kiwis, this time A. kolomitka. However, the widespread frost in New Brunswick about one week later hit the new plantings very hard. They were replaced in July with twenty-one new A. kolomitka kiwiplants - three male and eighteen female. These plants seem to be holding up well and, along with those remaining from the original plantation, were mulched with sawdust for overwintering. The older plants have grown to the point that some branches have begun wrapping themselves around the first trellis wire. However, injury was already visible on the tips of these plants by early October. No fruit have been produced as of yet. There are now six mature males, three new males, nine mature females and eighteen new females at the site, giving a total of thirty-six plants.

References: Tremblay, R., J. Baker. "1990 Summary of Seven Small Fruit Crop Trials in New Brunswick". Adaptive Research Reports. N.B.D.A. 1990. Vol.12. 30.

DESSERT GRAPES TRIAL: This trial was established in 1985 to determine the feasibility of growing dessert grapes in New Brunswick's climate and to compare the different cultivars in terms of survival, productivity and fruit quality. The fourteen cultivars being tested are: Beta, Steuban, Valiant, St. Croix, Fredonia, Minnesota 81, Sovereign Coronation, Eona, 5231-1, Riparia, Michurinetz, Fortin, Minnesota 78 and Severnji.

The vines, which are growing on a three-wire trellis system, are pruned annually in the spring and the summer. Generally the spring pruning leaves two branches per wire with two buds per branch, while the summer pruning removes any new shoots from around the base of the vine as well as any dead or diseased material. Due to excessive growth, however, the vines were pruned five times in 1991, from April 30 through September 9. Since no fertilizers (or any other chemicals) were applied this year, this excessive growth could have been a result of last year's application of Triple-15, the first fertilizer application ever received by the vines. No other chemicals have ever been applied to this trial.

As in previous years, plant vigour evaluations this spring showed 80% of the vines experienced moderate to severe winter injury. The best survival was exhibited by the cultivars Beta and Minnesota 78, followed by Minnesota 81 and Steuban. Beta and Steuban were also among the most vigourous in the spring of 1990. The most injury in 1991 was found in Valiant, followed by 5231-1, Fredonia and Severnji. Although two of the three original Valiant vines died and were cut down to the base, a shoot from one base has developed into a new vine which produced three bunches of ripe grapes this year. One of the two vines of the 5231-1 cultivar was also cut back and produced a new vine which was quite vigourous by early September this year. Valiant and Severnji experienced a lot of winter injury in 1990 as well.

Refractometer readings taken on September 5, 1989 showed Sovereign Coronation, Michurinetz and Riparia had the highest sugar content of all the vines. Quality fruit production has been limited to only a few cultivars, with only two producing sizable, ripe grapes in 1989. After being put to the '89 taste test, Minnesota 78 grapes were reported to be 33% sweeter than Sovereign Coronation. This year production was improved with Sovereign Coronation, Valiant and Riparia all producing ripe grapes by early September, and many others with large green fruit in stages of ripening. The most grape bunches per plant were produced by Sovereign Coronation (average of ten), followed by Minnesota 78, St.Croix and Riparia. Severnji was the only cultivar which produced no grapes in any stage of development this year.

References: Tremblay, R., J. Baker. "1990 Summary of Seven Small Fruit Crop Trials in New Brunswick". Adaptive Research Reports. N.B.D.A. 1990. Vol.12, 30.

A SURVEY OF NEW BRUNSWICK RASPBERRY PLANTATIONS (R.Tremblay, K.Lynch, and C.Hollis): In the last week of October, 1991, a survey was conducted of New Brunswick raspberry plantations. This survey included twenty-four farms and covered all horticultural regions of the Province. The goal was to pinpoint the major causal factors of New Brunswick's typically poor raspberry production.

Normally, two raspberry cultivars were sampled per farm, but this varied from one to four depending on the size of the plantation. For each cultivar, the following samples were collected:

1) roots of six plants - for **root rot** tests
2) intra-row soil samples - for **nematode** analysis
3) inter-row soil samples - for **chemical**, **structural**, and **nematode** analysis

The age, average yield and cane height of each cultivar sampled were noted; and ratings of 1 - 5, from very poor to excellent, were given for the following factors: plant vigour, stand uniformity, root development, drainage, weed control, presence of crown gall and/or spur blight, and overall farm management.

Three types of fungi - Phytophthora spp., Pythium spp. and Rhizoctonia spp. - which are often associated with black root rot were tested for using **Agri-Diagnostics Multiwell Immunoassay** kits. Although results are not final, it looks as though Phytophthora and Pythium are the two most prevalent types.

Soil samples for nematodes were shipped to the Agriculture Canada Research Station in Vineland, Ontario for analysis which determines which, if any, species of nematodes are present, and at what population sizes. These results have not become available as of yet.

Additional root sampling will be carried out this spring. Once all the results are in, we will attempt to find a correlation between raspberry plant vigour and the presence of the nematode and/or fungi pests. The final report, including a much more detailed description of the testing procedures used, will be available in the **1992 Adaptive Research Reports**.

Acknowledgements: The authors would like to extend thanks to Melvin Spencer, Technical Assistant, for his work in this project.

This project was partially funded by the Canada/New Brunswick Cooperation Agreement on Agri-Food Development.

1991 FALL ROW COVER TRIAL: A trial has been set up on Steven Ferris' farm in Waterborough in order to compare various artificial row covers to straw mulch, in a fall application on strawberry plants. The field being used is a 1991 Annapolis plantation. The covers will be evaluated in terms of their insulating qualities (measured by a Campbell Scientific CR10 temperature datalogger), as well as their effects on winter survival, frost injury, earliness of harvest, berry weight and quality, and total yield. The percentage of marketable yield will also be calculated in this trial.

The nine treatments are set up in a completely randomized block design with four replications, as follows: T1-perforated polyethylene (500 holes/m2); T2-Gromax; T3-Kimberley Farms 1.5 oz.; T4-Kimberley Farms 0.6 oz.; T5-Typar; T6-Agryl P30; T7-Agryl P17; T8-control (no mulch); T9-straw mulch. Two thermistors lead from the datalogger to one rep of each treatment, one measuring the crown temperature and one the root temperature at a depth of four inches.

By next fall, the results of this trial as well as the 1990 fall row cover trial and the 1991 spring row cover trial should give New Brunswick strawberry growers a clear indication of which mulch to use and at what time of year, in order to maximize crop production while minimizing cost. For more information, refer to "The Fall Row Cover Advantage" and "The Spring Row Cover Advantage", Adaptive Research Reports, Volume 13, 1991.

This project is being partially funded by the Canada/New Brunswick Cooperation Agreement on Agri-Food Development.

HERBICIDE DEMONSTRATION TRIAL ON CAVENDISH STRAWBERRIES

R. Tremblay, K. McCully, C. Hollis

ABSTRACT: Various registered herbicides at both labelled and above-labelled rates were evaluated for crop tolerance and weed control on Cavendish strawberries. Treatments were applied in the spring and summer of the planting year and again in the spring of the first fruiting year (1991). Some initial crop injury was observed from Sinbar and Tenoran, but the plants recovered over time. Weed control levels were highest in those plots treated with Sinbar and Simazine. In general above-labelled rates resulted in lower daughter plant production and yields. Exceptions to this were Tenoran, Treflan (ppi) + Sinbar (pre-), and Treflan (ppi) + Simazine (pre-), where the recommended rates resulted in lower daughter plant production and yields than the above-labelled rates. It is felt however that the early Treflan (ppi) applications stressed the Cavendish plants, causing additional injury when Sinbar and Simazine were applied. Of the herbicide-treated plots, those treated with Tenoran at the above-labelled rate and Devrinol at the labelled rate produced the highest yields. None of these plots were as productive as the weed-free control, however. Except for the combinations of Sinbar and Simazine with Treflan, the Cavendish cultivar appears to be very tolerant to all registered herbicides at the recommended rates.

ESSAIS D'HERBICIDES SUR LES FRAISIERS CAVENDISH

RESUMÉ: On a évalué la tolérance des fraises Cavendish et la suppression des mauvaises herbes pour divers herbicides enregistrés à la fois aux doses recommandées et à des doses supérieures. On a traité les fraisiers au printemps et à l'été de l'année de la plantation et de nouveau au printemps et à l'été de la première année de formation des fruits (1991). On a observé certains dommages aux fraisiers causés par les herbicides Sinbar et Tenoran, mais les fraisiers se sont remis des dommages avec le temps. On a enregistré les taux de répression les plus élevés dans les parcelles traitées au Sinbar et au Simazine. En général, les doses supérieures à celles recommandées ont entraîné une production et un rendement moindres des plants de la deuxième génération, sauf dans le cas du Tenoran, du Treflan (incorporé au sol avant la plantation) + Sinbar (prélevée) et du Treflan (incorporé au sol avant la plantation) + Simazine (prélevée), où les doses recommandées ont entraîné une production et un rendement moindres des plants de la deuxième génération que ceux à des doses supérieures. Toutefois, on considère que les traitements au Treflan (incorporé au sol avant la plantation) tôt dans la saison causaient un stress aux fraisiers, ce qui entraînait des dommages plus graves lors des traitements au Sinbar et au Simazine. Des parcelles traitées aux herbicides, celles protégées par du Tenoran à une dose supérieure et par du Devrinol à la dose recommandée ont produit les meilleurs rendements. Toutefois, aucune de ces parcelles n'a donné un aussi bon rendement que les parcelles non traitées aux herbicides. Sauf dans le cas du Treflan suivi d'une application de Sinbar et de Simazine, les cultivars Cavendish semblent très bien tolérer tous les herbicides enregistrés aux doses recommandées.

INTRODUCTION: Within the strawberry industry weed control is one of the more serious problems confronting growers. Due to the potentially high cost of hand-weeding, producers must often turn to using herbicides. There are a number of herbicides registered for weed control in strawberry plantations, but the rates often vary with the soil type and the cultivar of strawberry being grown.

Tolerance of the older cultivars to various herbicides is generally well known, but information on the newly-released Cavendish cultivar (formerly "K83-4") is lacking. A trial was therefore conducted to evaluate and demonstrate the effects of various herbicides at both registered and above-registered rates on Cavendish strawberries. Growers were able to observe the results at a field day held on October 11, 1990.

METHODS AND MATERIALS: Cavendish strawberries were planted May 14, 1990, at the Grand Falls Regional Agriculture Office. Plots measured 4 m in length, with

6 plants per row spaced at 0.6 m. There were seventeen rows in total spaced 0.6 m apart, the two end rows being designated as guards. Treatments were not replicated as this was a demonstration trial only.

Prior to planting, Triple-10 fertilizer was applied at a rate of 270 kg/ha, and tilled to a depth of 3-5 cm. Broadcast applications were made on June 28 and August 13, at rates of 270 kg/ha and 360 kg/ha respectively. Thiodan was also applied on June 28, 1990, at a rate of 5 L/ha, to control flea beetles. A soil sample taken in late August showed the pH to be at 6.1, while the soil's organic matter content was 3.1%. No insecticides were applied in 1991 and strawberry clipper weevils became a major problem.

Table 1 lists the treatments and the rates applied. The Simazine formulation used was Princep Nine-T. All herbicides except Treflan were applied June 13 and August 13, 1990, and again on May 19, 1991[1]. Treflan is a pre-plant-incorporated (ppi) herbicide which cannot be used following planting, and was therefore applied only on June 13, 1990. No fall applications were made in 1990 due to unfavourable weather conditions. Runners were set on August 13, 1990.

Weed control and crop damage were evaluated on October 11, 1990. In addition the number of rooted daughter plants per treatment were counted. The overwintering straw mulch was removed on May 13, 1991 and berry harvesting commenced July 8. The total number of berries in each harvest were counted and all berries weighed for each plot.

RESULTS AND DISCUSSION:

A) Crop Injury: Crop damage caused by herbicides was both selective and minimal. The high rate of Sinbar resulted in plants showing characteristic symptoms of yellowing in the veins and some setback to plant growth, while the lower rate resulted in similar symptoms but to a lesser degree. Plants treated with Tenoran also showed signs of herbicide injury in the form of yellow blotches on the leaves. There were no observable symptoms of damage from the other treatments. Based on the visual observations, Cavendish strawberries appear to be very tolerant to the applied herbicides.

B) Weed Control: In terms of weed control effectiveness, the herbicides were rated by comparing each treatment to the Weed-Free plot (100% control) and

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[1] *Spring applications in the fruiting year are not registered for the herbicides Simazine and Enide.*

TABLE 1: Evaluating the treatments

TREATMENT NAME	#	PRODUCT RATE	WEED CONTROL - 1990 ONLY	# DAUGHTER PLANTS - 1990 ONLY	TOTAL YIELD (KG/HA)
Treflan (545EC)	T1	2.01 L/ha	Good	8.5	2243.7
Treflan (545EC) + Sinbar (80WP)	T2	2.01 L/ha + 0.5 kg/ha	Very Good	10.4	1043.3
Sinbar (80WP)	T3	0.86 kg/ha	Very Good	11.0	1964.4
Treflan (545EC) + Simazine (90WG)	T4	2.01 L/ha + 1.0 L/ha	Good	6.0	473.6
Simazine (90WG)	T5	1.25 L/ha	Good	14.3	1882.3
Devrinol (50WP)	T6	9.0 kg/ha	Fair	12.0	2668.4
Devrinol (50WP)	T7	11.2 kg/ha	Fair	6.0	1446.2
Dacthal (75WP)	T8	13.0 kg/ha	Poor	9.5	2046.8
Dacthal (75WP)	T9	17.9 kg/ha	Poor	6.0	564.2
Enide (50WP)	T10	11.0 kg/ha	Fair	11.0	1989.4
Enide (50WP)	T11	16.9 kg/ha	Fair	8.7	1905.4
Tenoran (50WP)	T12	11.0 kg/ha	Fair	8.6	1848.9
Tenoran (50WP)	T13	16.9 kg/ha	Fair	9.1	3496.3
Weedy Control	T14	-----	No Control	6.3	577.2
Weed-Free Control	T15	-----	Excellent	28.0	5581.6

the Weedy plot (0% control). The highest levels of control resulted from plots treated with Sinbar, followed by Simazine-treated plots. Dacthal provided the lowest levels of control. There were no differences in weed control when comparing the recommended and above-recommended rates of each herbicide, indicating that higher than registered rates are not necessary for increased weed control.

C) Berry and Daughter Plant Production: The above-labelled rates of the various herbicides reduced daughter plant production as well as yields. This indicated that recommended rates should not be exceeded on Cavendish strawberries. Exceptions to this were Sinbar, Simazine and Tenoran, where the recommended rates resulted in lower yields and fewer daughter plants than the above-labelled rates. However, those plots which received the lower rates of Sinbar and Simazine had also received Treflan prior to planting. It is believed that this combination was responsible for the lower productivity of these plots. Treflan may have weakened the plants slightly, making them more sensitive to subsequent applications of Sinbar and Simazine. It is probable that the same Sinbar and Simazine rates applied without the earlier Treflan treatment would have resulted in the production of more daughter plants and higher yields than the above-labelled rates.

It is not understood why the plot treated with the above-labelled rate of Tenoran was more productive than that treated with the labelled rate. This should be further investigated. The lower, recommended rates of the remaining treatments all resulted in the production of more daughter plants and larger yields as compared to the above-labelled rates.

As expected, those plots producing high numbers of daughter plants generally produced high yields. The plot with the most daughter plants and the largest total yield was the untreated, weed-free control. This indicates that all herbicides reduced daughter plant and berry production somewhat. Treatments should be replicated before any valid statements or conclusions about this can be made, however. Of the herbicide-treated plots, Simazine at the above-labelled rate resulted in the highest number of daughter plants, while Tenoran at the high rate resulted in the highest yields. This suggests that Cavendish strawberries are very tolerant to Tenoran.

CONCLUSIONS: Crop injury was initially observed in the plots treated with Sinbar and Tenoran, but they recovered over time. The highest levels of weed control were found in those plots treated with Sinbar, followed by Simazine-treated plots. Cavendish appears to be very tolerant to the recommended rates of the herbicides. Above-labelled rates, however, resulted in a lower production of daughter plants and yields. Exceptions to this were Sinbar, Simazine, and Tenoran, where the above-labelled rates out-produced the lower registered rates. The combinations of Treflan with the low rates of Sinbar and Simazine appear to be responsible for the lower productivity of these plots, however. It is believed that the pre-plant-incorporated Treflan weakened the strawberry plants, making then more sensitive to Sinbar and Simazine applications.

None of the herbicide-treated plots were as productive as the hand-weeded, weed-free control. This plot produced the most daughter plants (28) and the largest total yield (5581.6 kg/ha). It is very important to stress however that because this was a demonstration trial only, these results are inconclusive. Factors such as soil fertility, organic matter, drainage and pH can and do vary from one row to another within the same field, and this may cause the results to be biased. In order to draw any valid conclusions about the effects of various herbicides on Cavendish strawberries, this trial would need to be repeated with at least four replications of each treatment.

ACKNOWLEDGEMENTS: Thanks are extended by the authors to Julie Baker, Jacques Bérubé, Darrell Hanscomb and Margaret Mann for their involvement in this trial.

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CAVENDISH CULTIVAR EVALUATION

Roger Tremblay, Carolyn Hollis

ABSTRACT: In the fall of 1990 and of 1991, a questionnaire was mailed out to all New Brunswick strawberry growers who received the newly-released cultivar Cavendish, in order to evaluate its productivity in both the planting and the first fruiting year. Generally, the growers were pleased with runner production and herbicide tolerance in the planting year. Winter survival was very good. In the first fruiting year, growers were very pleased with fruit size and quality, but very disappointed by the overall yield of Cavendish. The picking season was very short and there were few berries per plant. However, many blamed the poor production on the extremely dry summer New Brunswick experienced in 1991.

ÉVALUATION DES CULTIVARS CAVENDISH

RÉSUMÉ: À l'automne 1990 et 1991, on a posté un questionnaire à tous les agriculteurs néo-brunswickois qui avait reçu le nouveau cultivar Cavendish afin d'en évaluer le rendement à la fois l'année de la plantation et la première année de formation des fruits. En général, les agriculteurs étaient satisfaits de la production de stolons et de la tolérance aux herbicides durant l'année de plantation. Le nombre de cultivars ayant survécu à l'hiver était très bon. Dans la première année de formation des fruits, les agriculteurs étaient très satisfaits de la taille et de la qualité des fraises, mais déçus du rendement, car il y avait peu de fraises par plant. Toutefois, un grand nombre des agriculteurs ont imputé le faible rendement au temps extrêmement sec connu au Nouveau-Brunswick à l'été 1991.

INTRODUCTION: The strawberry cultivar Cavendish was developed at the Agriculture Canada Research Station in Kentville, Nova Scotia. A cross between the cultivars Glooscap and Annapolis, it was bred for the yield productivity of Glooscap and the high Red Stele resistance of Annapolis.

When tested in Kentville (with the identification K83-4), Cavendish was found to be a mid-season cultivar producing high yields of large, sweet berries. Resistance to Red Stele was very high, while the cultivar showed a moderate resistance to Verticillium wilt and powdery mildew. Like its Glooscap seed parent, Cavendish was found to be susceptible to green petal disease.

The cultivar was released in 1990. In an effort to evaluate its success in New Brunswick's growing conditions, a short questionnaire (one page) was mailed out to all those growers who received Cavendish (K83-4) plants from the New Brunswick Horticultural Centre in Hoyt. Mailed out in the fall of 1990, the survey contained a few questions on the grower's soil composition, fertilizers and herbicides applied, and runner and berry production in the planting year. There was also a space inviting any additional comments. Another form was sent out to the same growers in the fall of 1991, in order to evaluate the cultivar's production in the first picking year. This questionnaire was almost identical, with the exception that it contained questions on winter survival, harvest dates and season length.

There were thirty-four questionnaires sent out each year. A total of seven were returned in 1990 and eight in 1991.

Through a telephone follow-up, we were able to obtain information from nine more growers in 1991, giving a total return rate of 21% in 1990 and 50% in 1991.

RESULTS AND DISCUSSION:

1990 (Planting Year): Runner production was good in the planting year, with all but one respondent reporting an average of at least eight runners per plant, four of these reporting ten or more runners per plant. The one exception had only four runners per plant.

All of the respondents applied fertilizer to their fields at some time during the planting year. Five of the seven applied herbicides and these (Treflan, Simazine, Tenoran, Sinbar, Fusilade) seemed to have no detrimental effects on runner production.

Two growers expressed that the Cavendish plants were hardy and vigourous, while another found this cultivar to be less productive in runners and blossoms than other cultivars.

1991 (First Fruiting Year): The growers were generally pleased with the winter survival of Cavendish, with only four of the seventeen respondents reporting less than good survival.

Most of the growers began harvesting their Cavendish plants around the same time as, or 3-4 days later than, the Kents. This was anytime after June 25 in southern New Brunswick (Fredericton, Woodstock, Grand Lake, Sussex), while growers in the northern/north-eastern regions (Bouctouche, Richibucto, Bathurst) began harvesting anytime from July 2 to July 10. Although the picking season lasted an average of three weeks, many were dissatisfied with the harvests. The Cavendish seemed to produce many berries at first, but after only 2-3 days production began dwindling to almost no berries. As well, there were few berries per plant. Most rated their overall yields to be average or low, some estimating that the Cavendish produced only about half the yield of other cultivars. However, many blamed this poor production on the extremely dry summer experienced by New Brunswick in 1991. The majority of growers reported that the berries which were produced were very large, sweet-tasting, and generally of good quality. The dark color of the berries caused a problem for some growers, however, as many customers mistook this quality for over-ripeness. One grower found a lot of deformity in the Cavendish.

Cavendish were found to be very susceptible to leaf spot/leaf scorch by one grower.

Runner production in the first fruiting year varied, with some growers reporting good-excellent production and others finding only fair or poor runner production.

1991 marked the final year for Cavendish evaluation questionnaires to be sent out.

CONCLUSIONS: Growers' opinions of the Cavendish cultivar varied. Some were very pleased and plan on planting more in the future, while others were quite disappointed and will stick to other cultivars. Runner production and winter survival were very good, and most growers were very pleased with the size and quality of the berries. However, most growers were dissatisfied with the overall yield of the Cavendish plants, which was as low as half the yield of other cultivars in some cases.

Very few disease problems were reported and the cultivar seems to be very tolerant of herbicides. For a more detailed evaluation of this cultivar's tolerance to herbicides, refer to **"Herbicide Demonstration Trial on Cavendish Strawberries"**, Adaptive Research Report, N.B.D.A. Volume 13 (1991) by Tremblay et.al.

REFERENCES: -----, "Cavendish Strawberry", Kentville Research Station Information Release, Agriculture Canada. 1990. No.13.

ACKNOWLEDGEMENTS: Thanks are extended by the authors to those growers who supplied information on their Cavendish plants.

FROST INJURY ON NEW BRUNSWICK STRAWBERRIES

Roger Tremblay, Carolyn Hollis

ABSTRACT: Two late frosts occurred throughout New Brunswick in May of 1991, with temperatures ranging from -2°C to -6°C. Many strawberry plantations were hit hard by the frost, which occurred with very little warning. Evaluations were carried out in the Fredericton - Grand Lake area to determine the extent of the loss suffered by strawberry growers. Results varied extensively with anywhere from 0% to 66% of the blossoms present at the time having been damaged by the frost. Those fields which were irrigated showed fewer losses.

DOMMAGES CAUSÉS PAR LE GEL AUX FRAISES DU NOUVEAU-BRUNSWICK

RÉSUMÉ: En mai 1991, le Nouveau-Brunswick a connu deux gels tardifs avec des températures variant entre -2 et -6 °C. Le gel a atteint un grand nombre de plantations de fraises, car les producteurs ne s'y attendaient pas. On a évalué les dommages dans la région de Fredericton à Grand-Lac afin de déterminer les pertes des producteurs de fraises. Les résultats variaient énormément, car on a constaté des dommages causés par le gel sur 0 à 66 % des fleurs sorties à ce moment-là. Les champs irrigués ont moins été atteints par le gel.

INTRODUCTION: Many strawberry growers in New Brunswick experienced a large loss of blossoms due to frost in the spring of 1991. Two late frosts, one on the night of May 19th and another on May 23rd, brought temperatures ranging from -2°C to -6°C throughout the province. Very few of the growers were able to protect their plants because the frost occurred with very little warning. Even some of those who had available irrigation did not get their systems running in time to prevent damage. In order to determine the extent of the loss, frost injury evaluations were carried out at various farms in the Grand Lake and Fredericton area.

Fields differing in topography as well as different cultivars within a field were evaluated separately. For each evaluation, three 1m x 0.5m plots were randomly selected and the number of injured blossoms (indicated by blackening of the pistils (Figure 2)) counted, then compared to the total number of blossoms to calculate the percentage of frost injury.

SUMMARY: The results showed that frost injury varied tremendously from farm to farm, and even within one farm between different fields. For instance, on one farm where three different Veestar fields were evaluated, the injury ranged from 7.3% to 49.8%. We did find that in comparing irrigated fields to non-irrigated fields on the same farm (and of the same cultivar), the irrigated plants showed a much lower percentage of injury. Overall, New Brunswick growers lost anywhere from 0% to 66% of the blossoms present on their strawberry plants at the time of the frosts.

CONCLUSIONS: All of the blossoms injured by the frost became non-marketable berries (Figure 1), since the fruit cannot properly form once the pistil is damaged. Additionally, these first blossoms of the season would have been the producers of the "king berries" - the largest berries which that plant will produce all season. Therefore frost is not something to be taken lightly by strawberry growers. Irrigation is one way growers can protect their blossoms from frost. Since the late frosts can occur with very little warning (as they did in May of 1991), growers should prepare themselves ahead of time by having their irrigation systems set up early in May, or by planning ahead an alternative method of protecting their plants.

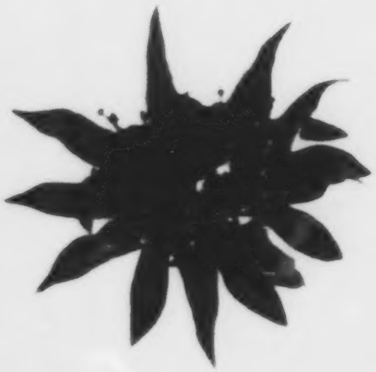

FIGURE 1: UNMARKETABLE STRAWBERRY RESULTING FROM FROST-INJURED BLOSSOM

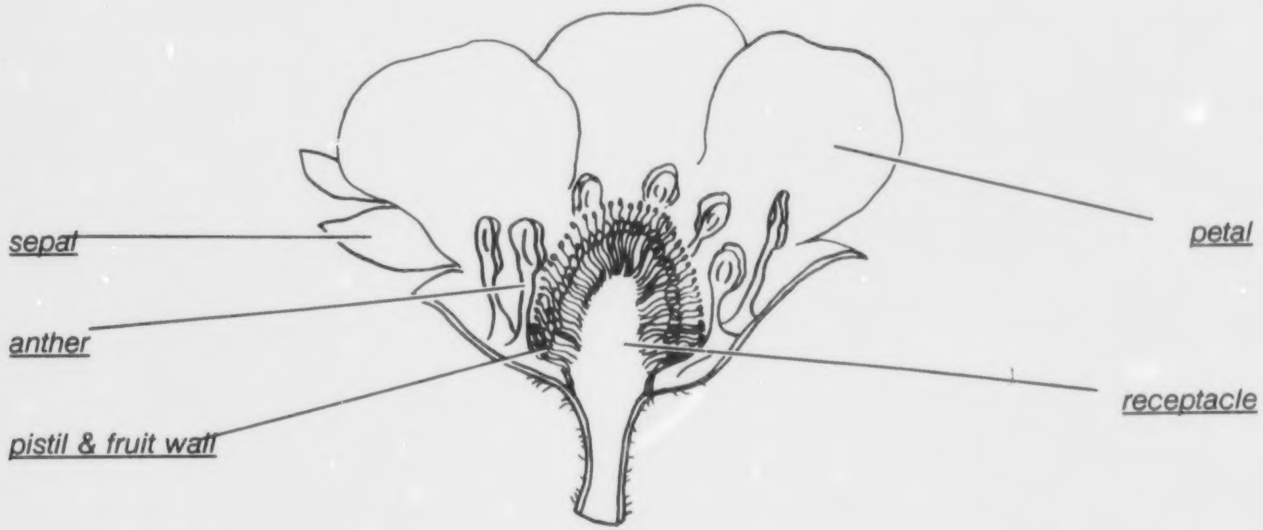
sepal
anther
pistil & fruit wall
petal
receptacle

FIGURE 2: **STRAWBERRY FLOWER** - *longitudinal section*

STRAWBERRY NEMATODES IN NEW BRUNSWICK

Roger Tremblay, Carolyn Hollis

ABSTRACT: Some nematode species feed on strawberry roots and may pose an economic threat to the crop if their populations are sufficiently large. In order to determine the prevalence of the various species in New Brunswick, fields from nine farms around the Province were sampled and analyzed at the Vineland Research Station. The most damaging species, the root lesion nematode, was found in 95% of the fields tested, 61% of these in above-threshold levels. The root knot nematode, another injurious species, was found to be above threshold in 11% of the fields. Pin nematodes were also found to be quite prevalent but none at threatening population sizes.

NÉMATODES DES FRAISIERS AU NOUVEAU-BRUNSWICK

RÉSUMÉ: Certaines espèces de nématodes se nourrissent sur les racines des fraisiers et peuvent nuire à la valeur marchande des récoltes si leurs populations sont assez nombreuses. En vue de déterminer la prédominance de[illegible]ines espèces au Nouveau-Brunswick, on a prélevé des échantillons dans neuf exploitatio[illegible]coles de la province qui ont été analysés à la Station d'horticulture expérimentale à Vir[illegible] Les espèces les plus nuisibles, les nématodes des racines, étaient présentes dans 95 % des champs échantillonnés et se trouvaient dans des nombres supérieurs au seuil acceptable dans 61 % de ces champs. On a trouvé dans 11 % des champs un nombre supérieur au seuil acceptable de nématodes de nodosité des racines, une autre espèce nuisible. On a également remarqué une prédominance du nématode acuminé, mais les populations n'étaient pas supérieures au seuil acceptable.

INTRODUCTION: Plant-parasitic nematodes are microscopic round-worms which live in the soil and feed on plant material. Some species of nematodes feed on strawberry roots and can therefore be economically damaging to this crop. The most injurious species is the root lesion nematode (*Pratylenchus* spp.), while other harmful species include root knot (*Meloidogyne* spp.) and pin (*Paratylenchus projectus*) nematodes. Crops can tolerate these pests at low levels, but once the species' population threshold level is surpassed, control measures such as fumigation or crop rotation should be exercised. In order to determine the prevalence of various nematode species in New Brunswick strawberry fields, and thus to ascertain the need for better control practices, soil samples were collected from several farms around the province and shipped to Vineland, Ontario to be analyzed.

MATERIALS AND METHODS: In late August of 1991 a total of fifty-seven strawberry fields were sampled from nine farms around the Province of New Brunswick. Using a metal soil-sampling tube a one-litre sample was collected from each field, including both the soil surrounding the roots as well as actual root sections. Each field at a given farm was sampled individually, since it is very possible to have a huge population of nematodes in one field and very few in another at the same farm, if the fields are separated by a crop upon which the nematodes do not feed.

The samples were shipped to the Agriculture Canada (Vineland) Research Station in Ontario where the types and amounts of nematodes were identified.

RESULTS AND DISCUSSION: The summarized results are illustrated in Table 1, where threshold levels are also listed. It should be noted that previously the threshold level for root lesion nematodes was considered to be 1000 per kilogram of soil. However, due to greater damage being inflicted upon strawberry plantations by smaller populations of this species, the tolerable level has been dropped to 500.

Roots and soil were analyzed separately for both the root lesion and the root knot nematodes. Since the nematodes are often concentrated on the roots, it is possible to have an above-threshold level detected in the root analysis while the soil sample for the same field shows an acceptable level of nematodes. It is also possible for the soil to show more nematodes than the roots, if the sample was taken at a time when the nematodes were not feeding. In these cases the highest level detected should be the one used to determine whether control measures will be taken. Therefore the "OVERALL" column in the results table indicates the total number of fields based on either the soil or the root analysis, with fields where both analyses affected the results being counted as one.

Root lesion nematodes were the most predominant species detected, with 35 of the 57 fields tested (61%) having populations exceeding threshold. The pin nematodes are also quite prevalent, but none of the fields were found to have populations large enough to pose a threat to the crop. Root knot nematodes were found in only 17% of the fields tested, with only 11% of the populations exceeding threshold.

As noted following the table, spiral, ring and needle nematodes were detected in some fields. These were not considered important since the impact of the first two on yield, if any, is unknown, while the latter is only considered harmful when found in combination with dagger nematodes.

CONCLUSIONS: Root lesion nematodes, as well as being the most prevalent species in New Brunswick, are also the most injurious to strawberry plantations. The same was true in 1990. This indicates that better monitoring and control methods are needed.

One method for controlling large nematode populations is fumigation. This is quite disheartening to the affected growers, since it is a practice which requires the field to be plowed under completely. To prevent this, all fields should be tested in the early fall prior to planting so that if needed, fumigation can be carried out before the loss of any plants. Rotation with summer

TABLE 1: Harmful Nematode Species Detected In New Brunswick Strawberry Fields

A TOTAL OF 57 STRAWBERRY FIELDS WERE SAMPLED AROUND THE PROVINCE.	**ROOT LESION**			**PIN**	**ROOT KNOT**		
	PKS[*]	PGDR[**]	OVERALL	PKS	PKS	PGDR	OVERALL
# FIELDS WHERE DETECTED	54	24	54	37	9	2	9
# FIELDS WHERE POPULATION EXCEEDED THRESHOLD	30	15	35	0	5	2	6
LARGEST POPULATION DETECTED IN ONE FIELD	5280	541	---	3420	5760	160	---
AVERAGE POPULATION SIZE PER FIELD	983	50	---	227	181	4	---

[*] PKS = PER KILOGRAM OF SOIL

[**] PGDR = PER GRAM OF DRY ROOT

THRESHOLD VALUES:
ROOT LESION NEMATODES:
500 NEMATODES PKS
50 NEMATODES PGDR

PIN NEMATODES:
5000 NEMATODES PKS

ROOT KNOT NEMATODES:
500 NEMATODES PKS
50 NEMATODES PGDR

Other nematode species detected: Spiral nematodes were detected in sixteen of the fifty-seven fields, at an average population size of 161 pks. The largest population detected was 2220 pks. Ring nematodes were detected in two of the fields at 20 pks each, while needle nematodes were detected in only one of the fields, at 8 pks. Needle nematodes are only considered harmful when found in association with dagger nematodes, when they have a threshold population level of 200 pks.

fallow and some green manure crops will also reduce the nematode populations. Once established, all strawberry fields should be sampled at least once yearly in order to monitor the nematode levels. All strawberry growers should watch for an upcoming publication of the New Brunswick Department of Agriculture on nematode control in strawberries and raspberries.

Results, especially for large numbers of samples, may take months to attain. Therefore, in the future, random sampling should be carried out no later than the first week of August, in order that the results may be available in time for any necessary control measures to be taken in the fall prior to planting.

REFERENCES: Tremblay, R., J. Baker. "1990 Summary of Seven Small Fruit Crop Trials in New Brunswick". Adaptive Research Report. N.B.D.A. 1990. Vol.12. 32.

Acknowledgements: Many thanks are extended to those at the Vineland Research Station who made this project possible, as well as the participating farms:

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LAURA WAINMAN	RESEARCH TECHNICIAN
MELVIN SPENCER	TECHNICAL ASSISTANT (N.B.)

This project was partially funded by the Canada/New Brunswick Cooperation Agreement on Agri-Food Development.

THE FALL ROW COVER ADVANTAGE

Roger Tremblay, Carolyn Hollis

ABSTRACT: A trial was established at a Fredericton site in the fall of 1990 in order to test and compare the effects of perforated plastic, straw, and no row cover in a fall application on strawberries. Results showed that although the perforated plastic mulch brought about an earlier harvest, the straw-mulched plants had better winter survival and produced a greater total yield. Irrigation was not available for frost protection.

AVANTAGE DE COUVRIR LES RANGS À L'AUTOMNE

RÉSUMÉ: À l'automne 1990, on a procédé à des essais à Fredericton afin d'évaluer et de comparer divers traitements des rangs à l'automne, c'est-à-dire soit les couvrir de plastique ou de paille soit les laisser sans paillis. On a constaté que les couvrir de plastique entrainait une récolte plus hâtive, mais que les rangs recouverts de paille survivaient mieux à l'hiver et donnaient un meilleur rendement. Aucune irrigation ne protégeait les champs du gel.

INTRODUCTION: Growers have long been protecting their strawberry plants from the harsh elements of winter using some type of row cover, such as straw or wood shavings. However the use of plastic in this way is a relatively new innovation and its comparability to natural mulches in a fall application remained unknown. In light of this, a trial was established in order to test the effects on production of an over-wintering plastic row cover to a straw mulch, comparing both to a non-mulched control. The treatments were evaluated in terms of their insulating qualities (measured by a computerized temperature datalogger - Campbell Scientific CR21[1]), and their effects on winter survival, frost injury, earliness of harvest, berry weight and quality, and total yield.

MATERIALS AND METHODS: The site chosen was a slightly sloped but uniform Veestar strawberry field planted in 1989. A soil sample taken in May of 1991 showed the pH to be 5.5 and the organic matter content at 6.2% (manure had been applied over the plants in 1989). The three treatments listed in Table 1 were arranged in a completely randomized block design of four replications. The plastic mulch (a polyethylene with 500 holes per square metre (Photo 1)) as well as the straw were put down on November 15, 1990 and the datalogging equipment was installed shortly thereafter. For one replicate of each treatment the root temperature at a four-inch depth and the crown temperature were recorded, and an additional thermocouple recorded the air temperature in a Stevenson Screen at 1.5 metres above the ground. Each of the twelve plots (three treatments x four replications) was approximately 7.5m x 9.3m. One-metre rulers were installed in three different locations of the trial site, for measuring snow depth.

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[1] Use of trade names in this publication is solely for identification purposes. No endorsement of the products named is implied by the N.B. Department of Agriculture, nor is discrimination intended to the exclusion of similar products named.

TABLE 1: Minimum and Maximum Temperatures[2] - °C

TREATMENT	CROWN				SOIL - AT A 4-INCH DEPTH			
	MINIMUM	DATE	MAXIMUM[3]	DATE	MINIMUM	DATE	MAXIMUM	DATE
T1 - **NO MULCH**	-8.35	08/01/91	15.37	29/04/91	-6.28	09/01/91	9.18	06/05/91
T2 - **STRAW**	-7.86	19/11/90	9.24	06/05/91	-6.99	10/03/91	8.57	05/05/91
T3 - **PLASTIC**	-4.00	11/01/91	26.82	28/04/91	-5.12	19/11/90	11.75	28/04/91
AIR	**MINIMUM:**		-27.2	26/01/91	**MAXIMUM:**		20.85	26/04/91

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[2] *Average temperature over a 6-hour time span.*

[3] *Prior to removal of all mulches.*

PHOTO 1: PERFORATED PLASTIC FLOATING MULCH

*PHOTO 2: STRAW-MULCHED PLANTS (on left)
VS. PLASTIC-TREATED PLANTS (on right) - MAY 1991*

Winter survival was evaluated on May 2, 1991 by removing ten randomly-selected plants from each rep and observing the crowns and roots of each. The plants were rated on a scale of [0 - 3], with a value of "0" representing no injury and "3" representing severe injury. The straw was removed on May 7 to increase the exposure of those plants to the sun; ten days later the plastic was removed when the blossoms began pushing the cover. Photo 2 shows the difference in growth between the plastic-mulched and the straw-mulched plants, following removal of both treatments. Frost injury was calculated from mid-May to early June by counting all the blossoms in three randomly-selected one-metre sections per rep, then counting the number of frost-injured blossoms (indicated by blackening of the pistils)[4]. Leaf samples were also taken for each treatment, and their nutrient levels analyzed.

Early in June, three 1m x 0.5m sections were again randomly chosen for each rep, then staked and roped in. All berries in each of these thirty-six sections were harvested from June 11 until July 16.

RESULTS AND DISCUSSION:

ALL STATISTICAL ANALYSES WERE CARRIED OUT USING ANOVA AT THE 0.05 LEVEL.

Temperature Monitoring: **Refer to Table 1.**

Minimum Temperatures: *All temperatures given refer to the average temperature over a six-hour time span. The minimum temperatures for all treatments were found to occur between November 19, 1990 and March 10, 1991.*

Figures 1 & 2 (November 19-20):

The minimum **crown** temperature for the **straw**-mulched plots (T2) was **-7.86°C**, which occurred on November 19, 1990 at 1800 hours (average of temperatures from 12:00pm to 6:00 pm). **See Figure 1.** The average air temperature at this time was only -5.52°C. This difference could be explained by the more frequent air movements at 1.5 metres above the ground. Also, there was no snow cover on the site on that date. The crown temperature under the plastic mulch (T3) at this time was -0.871°C, while the crown temperature where there was no mulch (T1) was -0.572°C.

The minimum **soil** temperature for the **plastic**-treated

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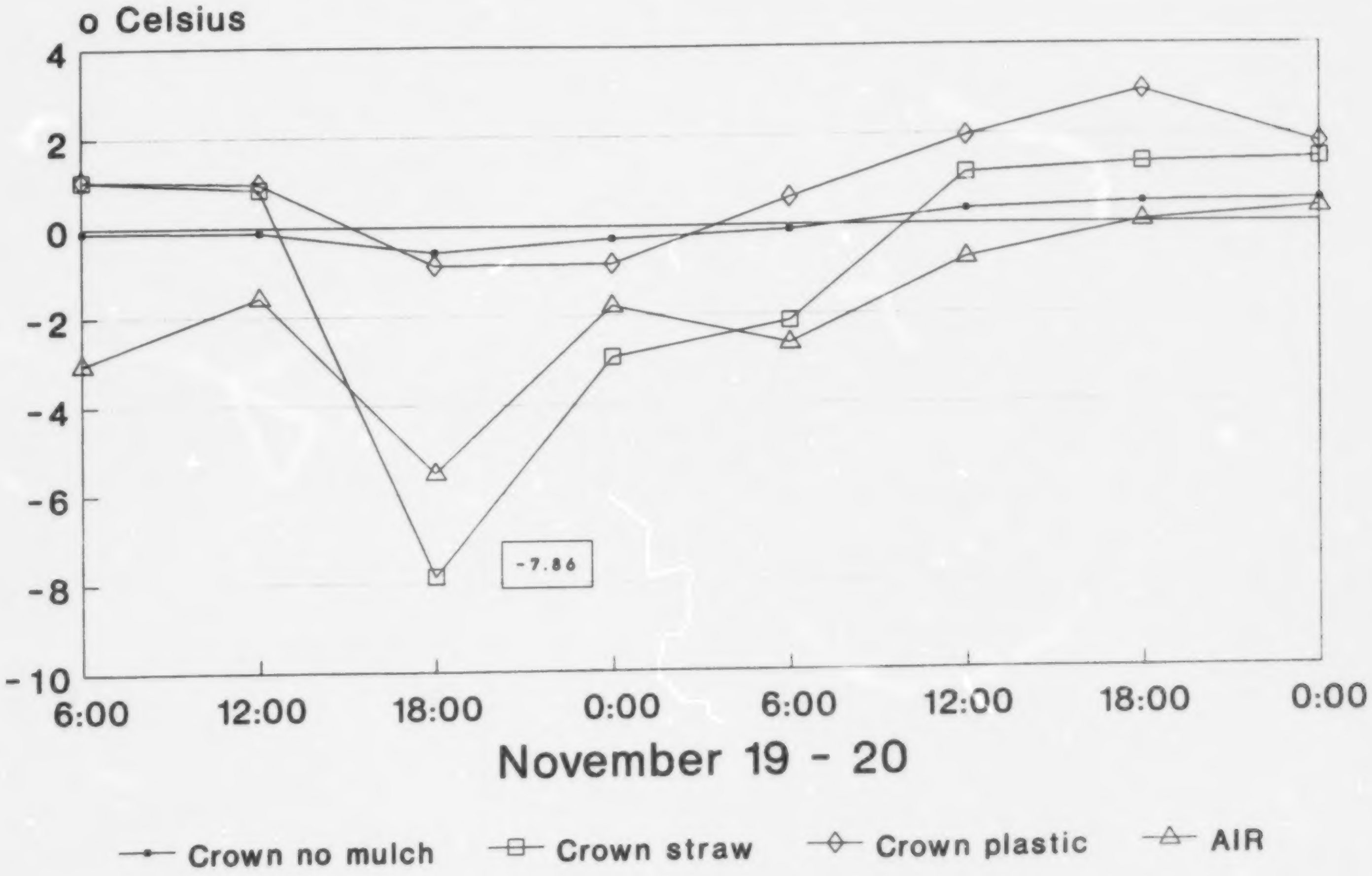
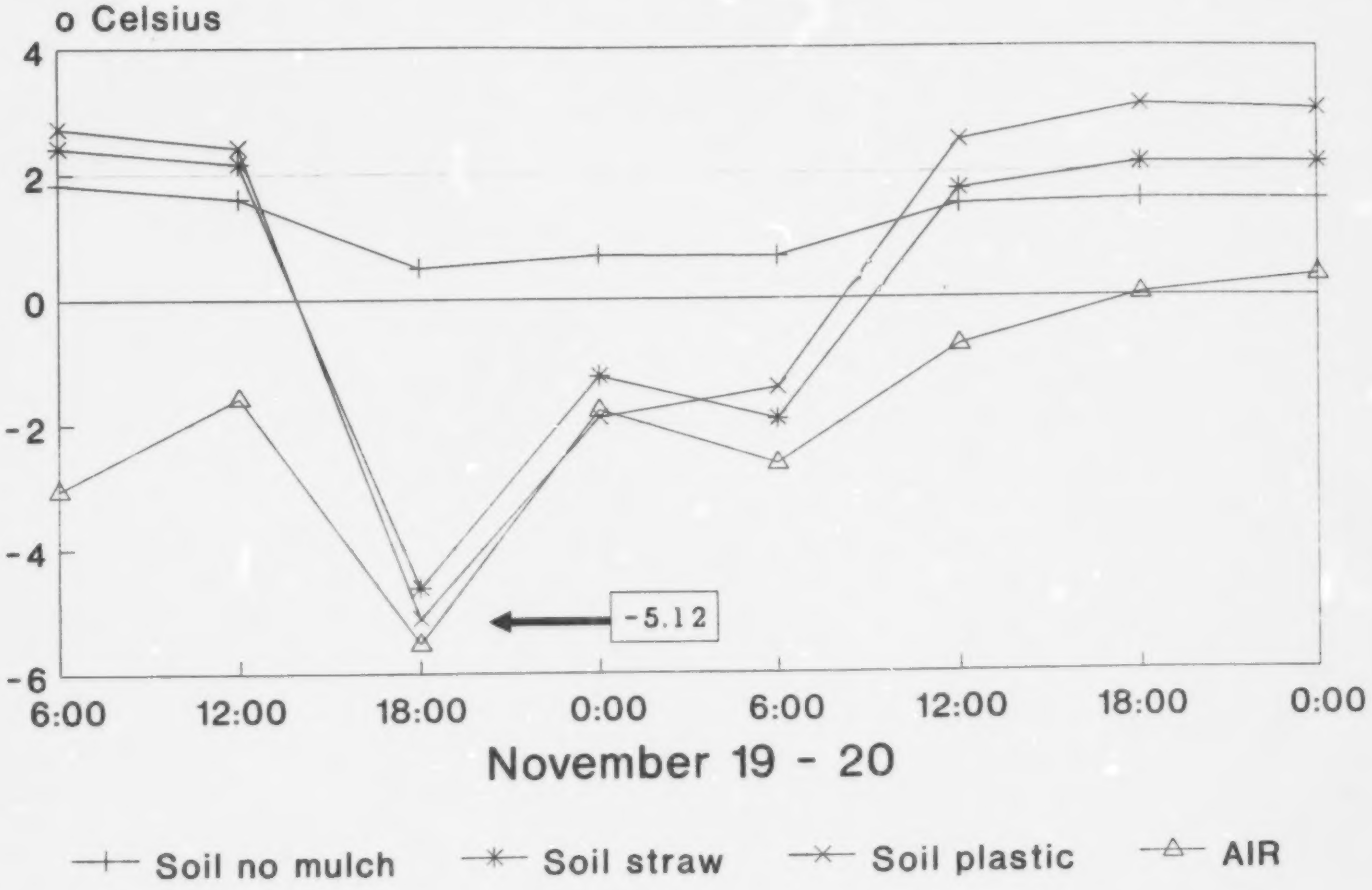
[4] *See "Frost Injury on New Brunswick Strawberries" by Tremblay and Hollis, Adaptive Research Reports, NBDA, Volume 13, 1992. Figure 1.*

FIG. 1: Minimum temperatures - Crown



Winter 90-91

FIG. 2: Minimum Temperatures - Soil 4"



Winter 90-91

plots (T3) was **-5.12°C**, also occurring on November 19, 1990 at 1800 hours. **See Figure 2.** At the same time the soil temperature was -4.63°C under the straw mulch, while the non-mulched plots had a soil temperature of +0.502°C.

Figures 3 & 4 (January 8-13):

The minimum **crown** temperature for the **non-mulched** plots (T1) was **-8.35°C**; this occurred on January 8, 1991 at 1200 hours. **See Figure 3.** The air temperature was much lower, at -23.1°C. At the same time, the crown temperature was -3.78°C under the straw mulch and -2.98°C under the plastic mulch. On January 10, 1991, a total snow depth of 9.33 centimetres was recorded.

The minimum **crown** temperature for the **plastic**-treated plots was **-4.00°C**, occurring on January 11, 1991 at 2400 hours. **See Figure 3.** The air temperature was recorded to be -19.3°C. At this same time, the crown temperature was -4.61°C in the plots with no mulch, and -4.49°C under the straw mulch. On January 13, 1991, a total snow depth of 32.66 centimetres of snow was recorded on the trial site.

The minimum **soil** temperature in the plots with **no mulch** (T1) was **-6.28°C**; this occurred on January 9, 1991, at 600 hours. **See Figure 4.** The air temperature at this time was -22.4°C, while the soil temperature was -3.73°C in the straw-mulched plots and -2.17°C in the plastic-mulched plots.

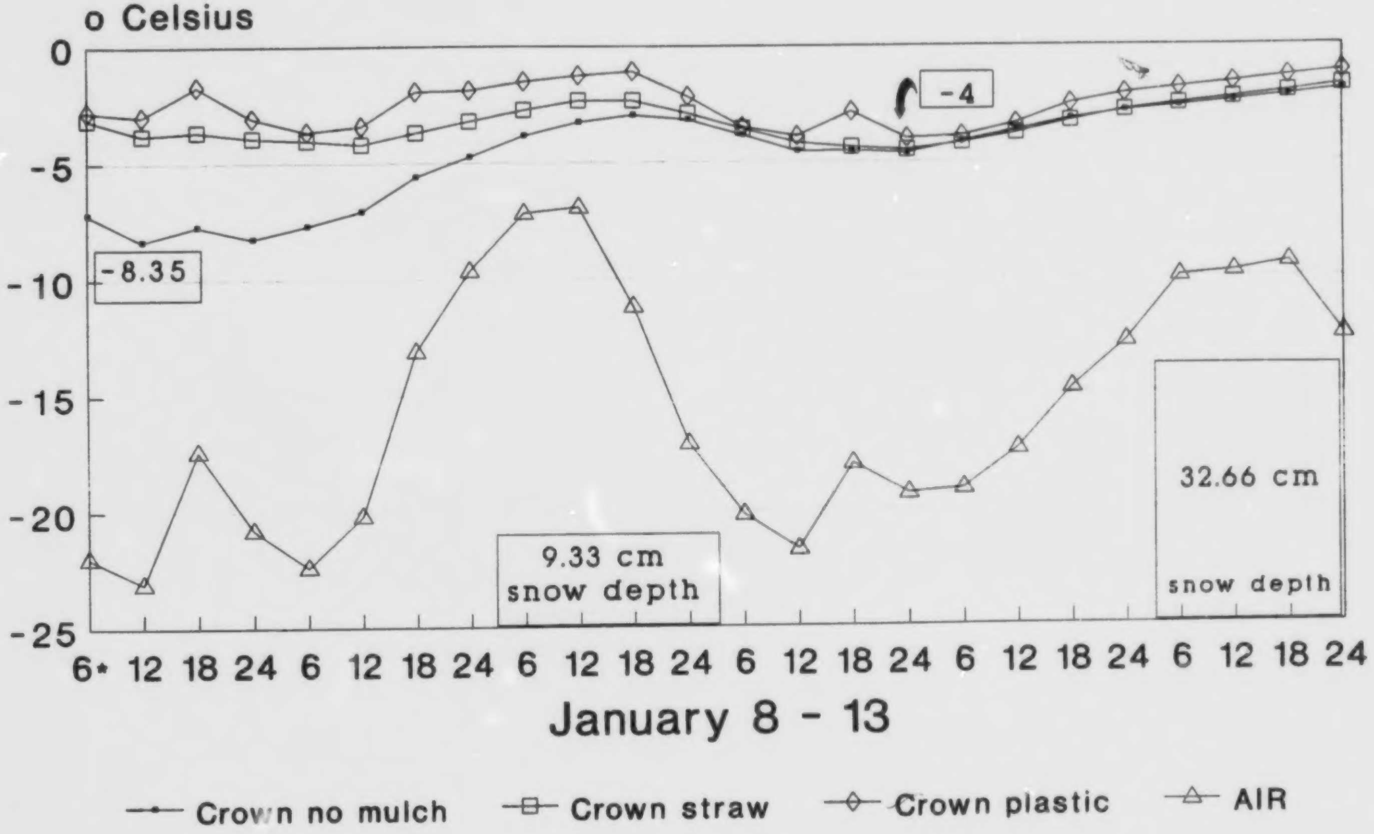
Figure 5 (January 24-28):

The minimum **air** temperature during the fall-winter period was **-27.2°C**. This occurred on January 26, 1991 at 1200 hours. **See Figure 5.** At the same time, the temperatures for all treatments ranged from only -1.36°C to -1.93°C at the crown level and -1.19°C to -1.40°C in the soil. This great difference between the air and the ground temperatures was probably due to the snow cover, which was at a depth of 31 centimetres on January 24. The type of snow present at that time acted as a great insulator.

As the air temperature rose to -5.56°C, the temperatures under all of the treatments dropped suddenly on January 28, 1991 at 1200 hours. This was probably due to an increase in snow density brought on by the rapidly increasing air temperature.

FIG. 3: Minimum Temperatures - Crown

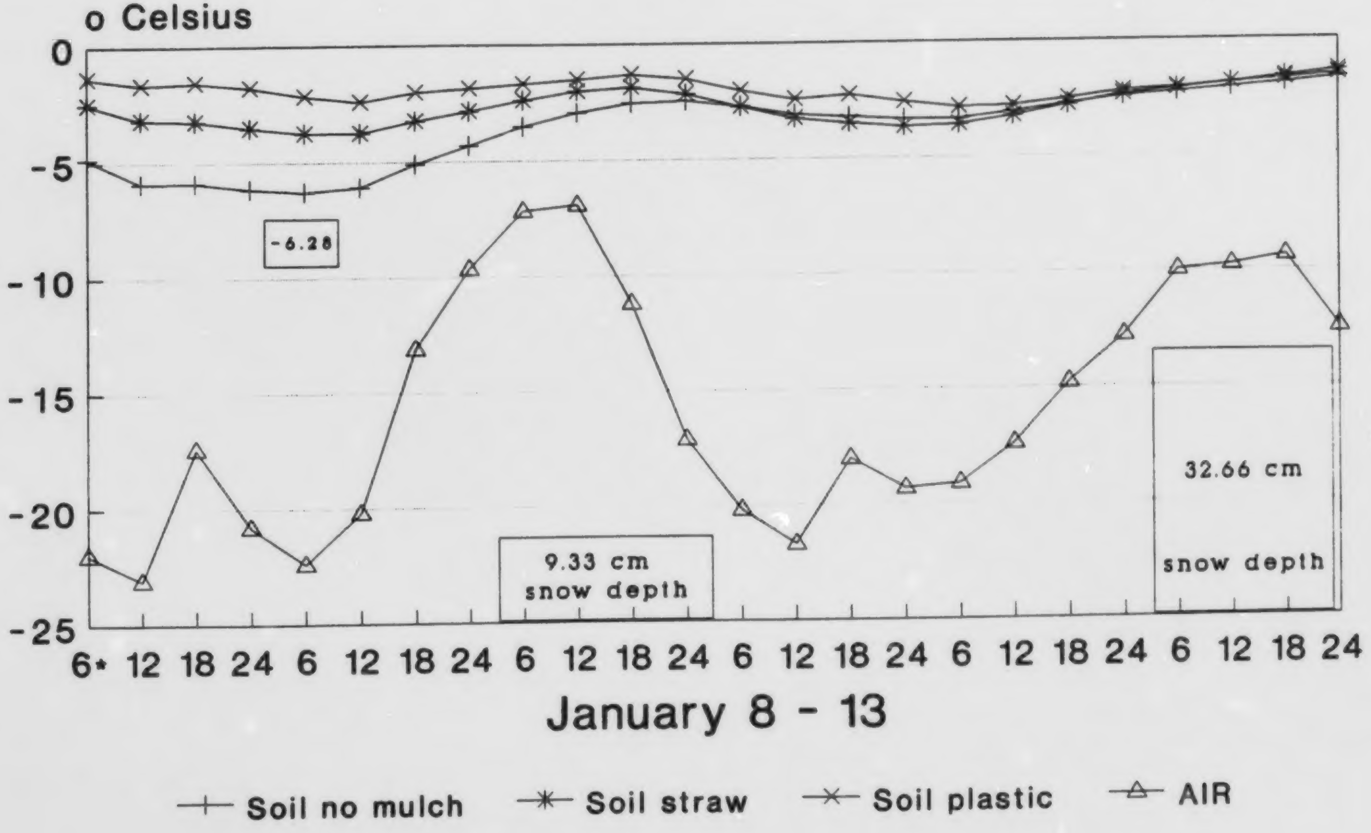
six hour averages



Winter 90 -91 * hours

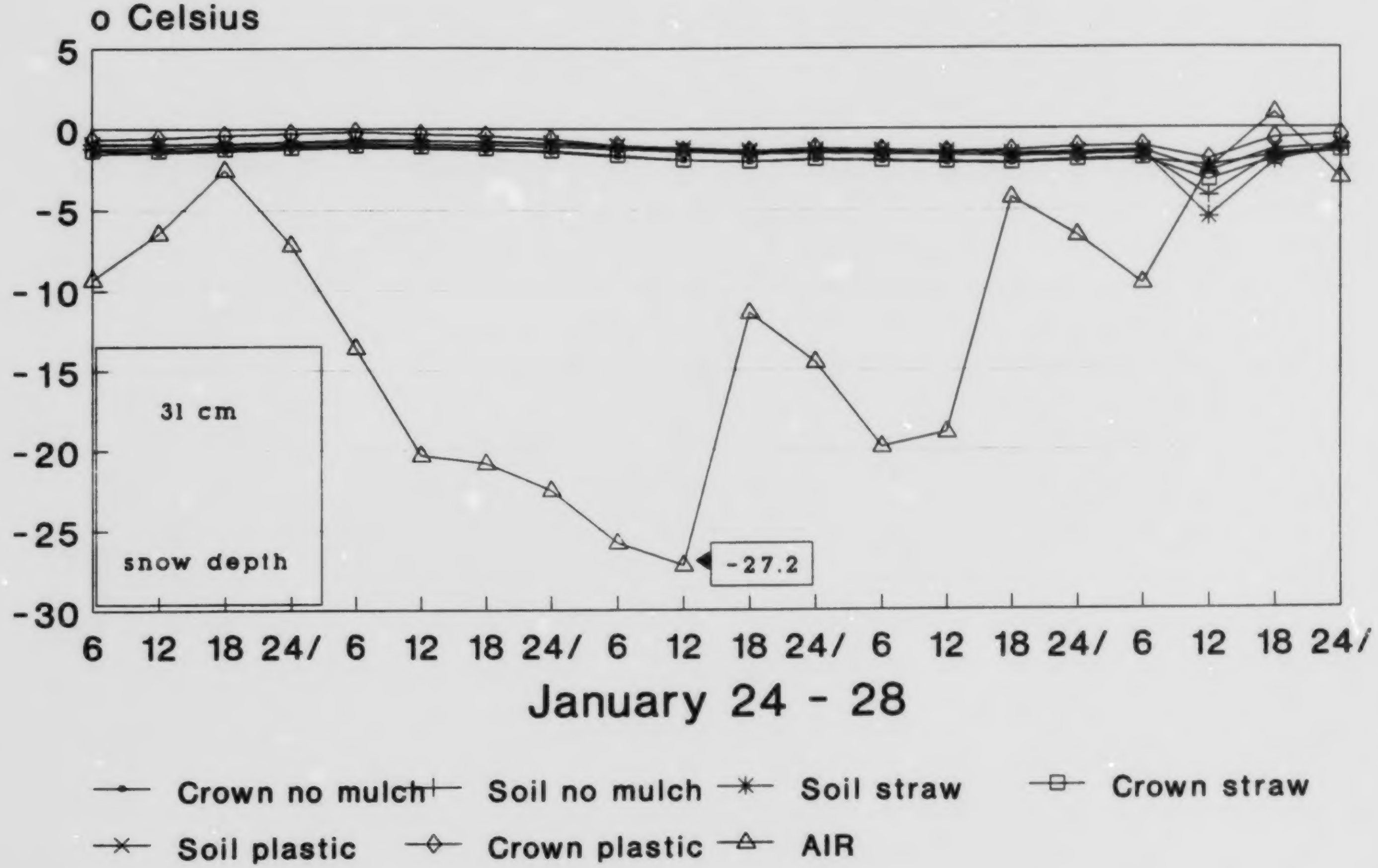
FIG. 4: Minimum Temperatures - Soil 4"

six hour averages



Winter 90 -91 • hours

FIG. 5: Air Temperature vs Treatments



Winter 90 -91

Figure 6 (March 9-11):

The minimum **soil** temperature for the **straw**-mulched plots (T2) was **-6.99°C**, and this occurred on March 10, 1991 at 1800 hours. **See Figure 6.** The air temperature at this time was -4.89°C. At the same time the soil temperature under the plastic mulch was -3.84°C and the un-mulched soil temperature was -1.36°C.

Maximum Temperatures: All temperatures given refer to the average temperature over a six-hour time span. The maximum temperatures for all treatments prior to mulch removal were found to occur between April 26 and May 6, 1991.

Figures 7 & 8 (April 26 - May 6, 1991)

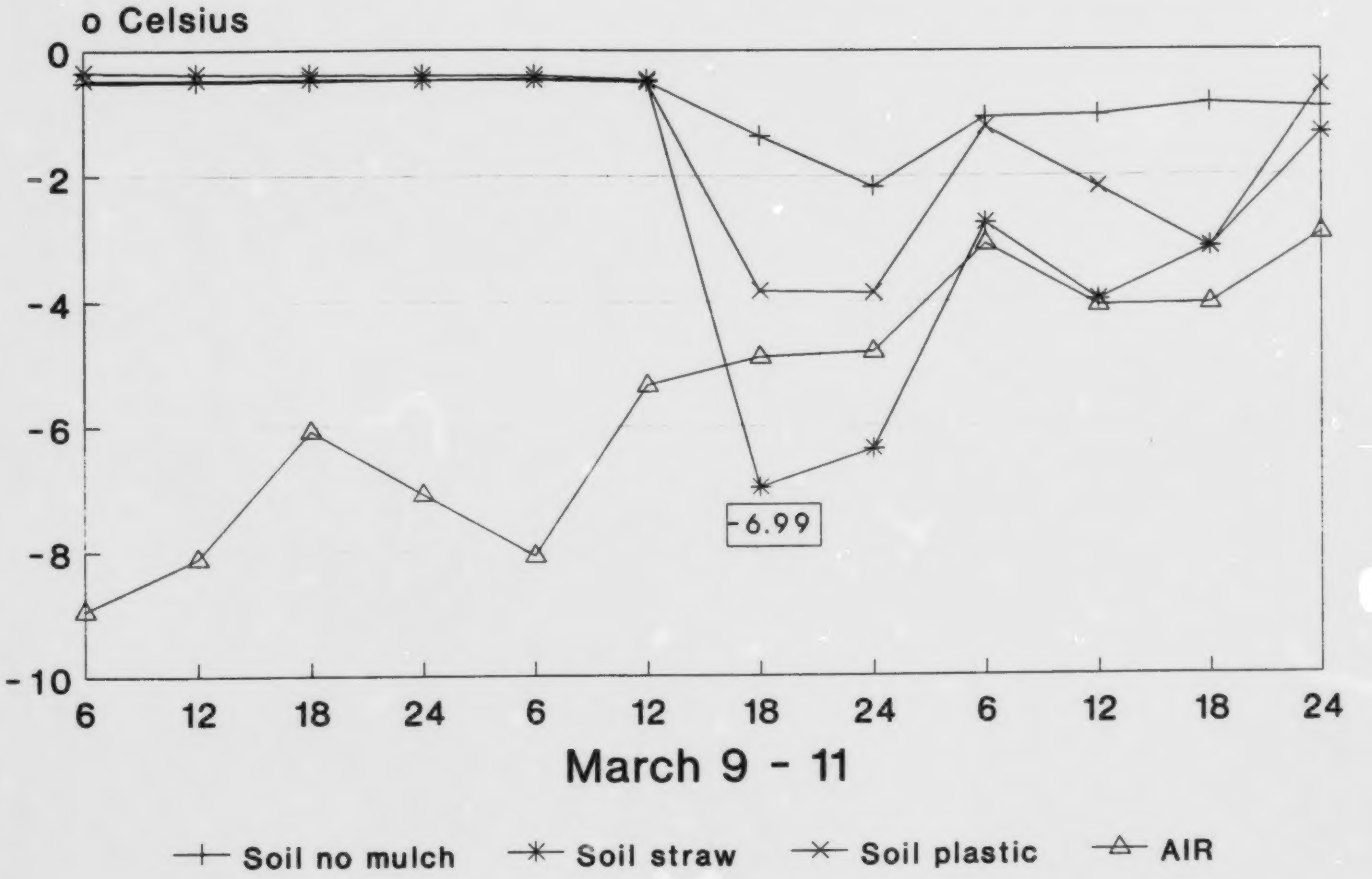
The treatment with the warmest **crown** temperature was the **plastic** (T3), reading **26.82°C** on April 29, 1991 at 1800 hours. **See Figure 7.** The average air temperature at this time was 17.67°C, while the straw mulch (T2) plots had a crown temperature of 7.36°C and the control (T1) a crown temperature of 15.15°C.

The treatment with the warmest **soil** temperature was the **plastic**-treated plot (T3), reading **11.75°C** on April 29, 1991 at 1800 hours. See **Figure 8**. At the same time the soil temperature under the straw (T2) was 6.23°C, while the non-mulched control (T1) had a soil temperature of 7.35°C.

Winter Injury: **Refer to Table 2.**
Winter injury was significantly higher in the non-mulched plants, with 57% more injury here than in either of the covered treatments. This is due to their direct exposure to the elements, leaving them vulnerable to cycles of freezing, thawing and re-freezing, causing stress and injury to the plants.

Frost Injury: **Refer to Table 2.**
On May 19th and again on May 23rd a widespread frost hit New Brunswick, bringing six-hour average temperatures of -0.93°C and 0.23°C to the trial site respectively. (The temperature dropped to -4°C in Fredericton on May 19). Results show that those plants treated with the plastic row cover were hit hardest by the frost, while those treated with straw were not affected at all. This is due not to better protection offered by the straw but to the hastening effects of plastic mulch on flower initiation. At the time of the frost there were very few blossoms present in the straw-mulched plots compared to the many blossoms - those which go on to produce the "king berries" - present in the plastic-treated plots (from

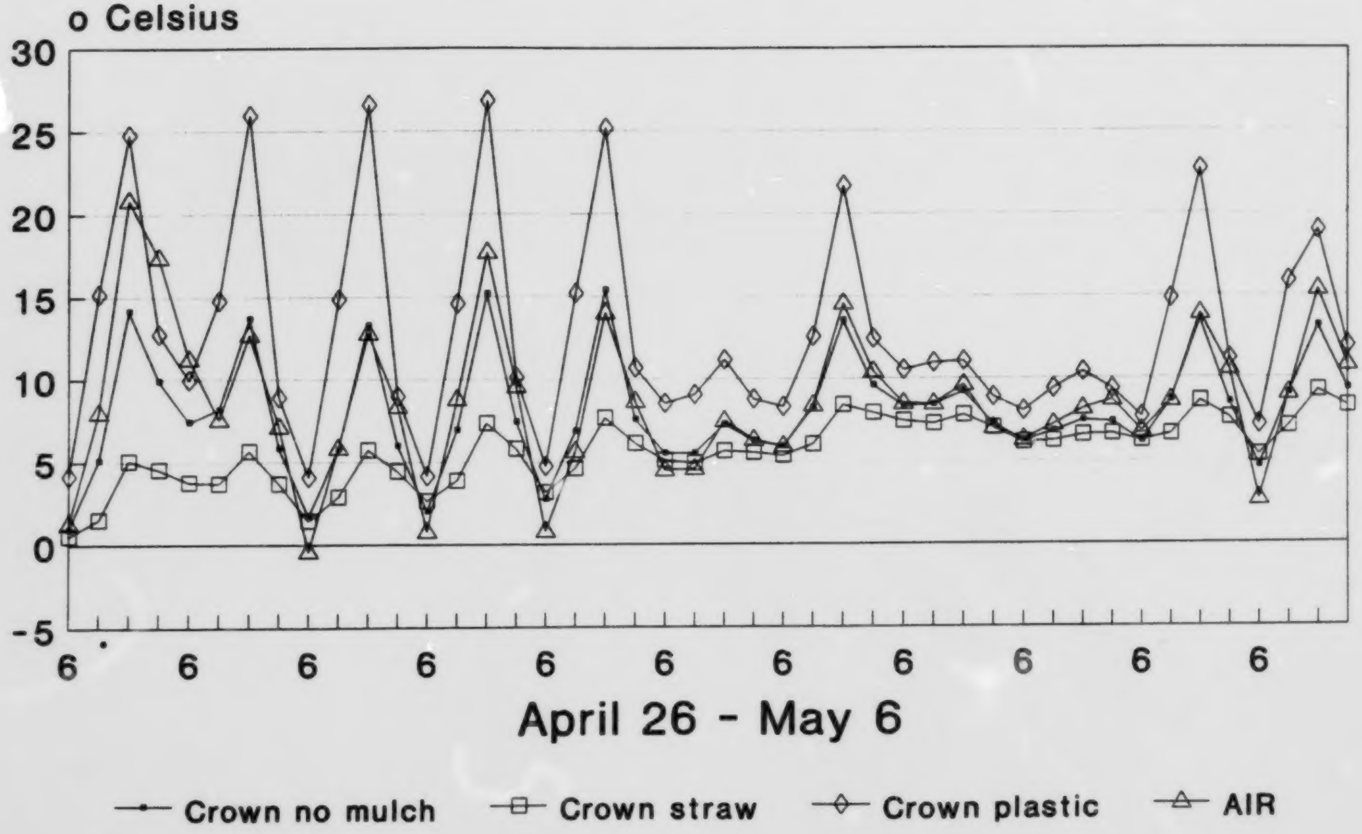
FIG. 6: Minimum Temperatures - Soil 4 "



Winter 90 - 91

FIG. 7: Maximum temperatures - Crown

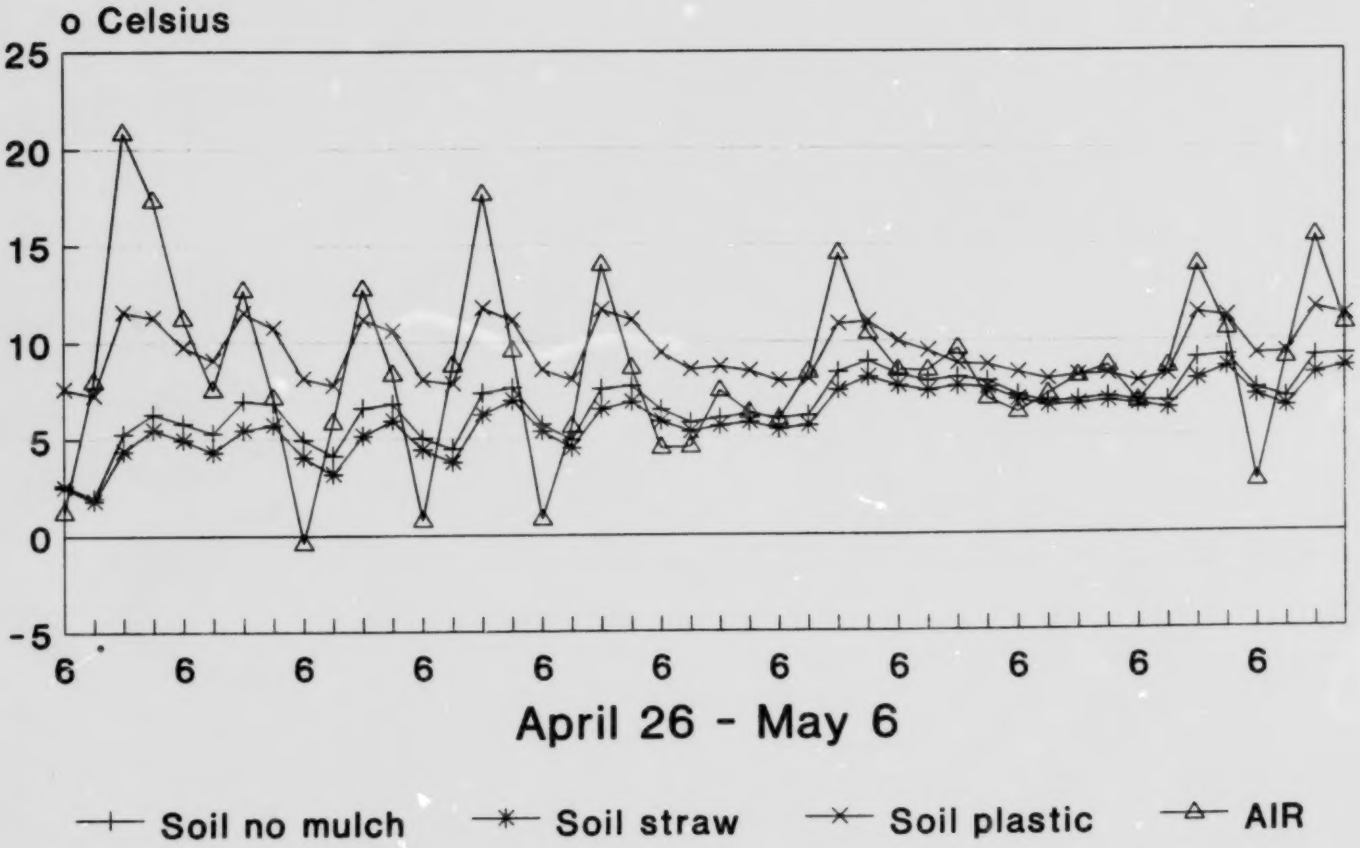
six hour averages



WINTER 90 - 91 * Temperatures recorded at 600, 1200, 1800 and 2400 hours

FIG. 8: Maximum temperatures - Soil 4"

six hour averages



WINTER 90 - 91 • Temperatures recorded at 600, 1200, 1800 and 2400 hours

TABLE 2: Comparing the Mulches

TREATMENT	WINTER INJURY[5]	FROST INJURY (%)	AVERAGE WEIGHT PER BERRY (g)	DEFORMITY (%)	TOTAL YIELD (kg/ha)[6]	COST (per m^2)
T1 - NO MULCH	1.75 A	55.6 B	5.19 A	40.66 A	23,575 A	$ 0.00
T2 - STRAW	1.05 B	2.5 C	5.28 A	33.26 A	27,950 A	$ 0.05[7]
T3 - PLASTIC	1.18 B	67.2 A	4.25 B	40.82 A	25,330 A	$ 0.27

Means followed by the same letter are not significantly different at the 0.05 level of Duncan's Multiple Range Test.

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[5] *Scale of [0-3] as described above.*

[6] *Includes both marketable and non-marketable fruit.*

[7] *Using 3.5 bales per 7.5m x 9.3m plot, at $1.00 per bale.*

which the plastic was removed one day before the first frost hit). The frost injury was evaluated for each treatment only when there were a tangible number of blossoms present. The straw-mulched plants were so far behind in flower initiation that by the time they were evaluated the few injured blossoms had already dropped off.

Leaf Analysis: Strawberry leaf samples taken in late May and early June, 1991 showed no differences in nutrient levels between the treatments. Boron was found at an average level of 28ppm[8].

Average Weight per Berry: **Refer to Table 2.**
The king berries are the first and largest berries the plants will produce all season - these were the blossoms lost by the plastic-treated plots. Any new blossoms produced by these plants following the frost developed into smaller berries, giving this treatment a lower average berry weight. Since the straw-mulched plants were just beginning to blossom, there were still many "king blossoms" to be produced by these plants after the frost, leading to larger berries on the average.

Berry Quality: **Refer to Table 2.**
Although the percentage of deformity was found to be a bit lower in the straw-treated plots, the differences were found to be insignificant. Deformed berries are often due to climatic conditions such as frost, but they can also result from problems in the microclimate such as Boron deficiencies or damage from insects, such as the tarnished plant bug.

Total Yield: **Refer to Table 2.**
Although the differences in total yields over the entire season were found to be insignificant, the plastic-treated plants still produced significantly higher yields over the other two treatments for the first three harvest dates. This occurred in spite of the huge loss of early blossoms in the plastic-treated plots. This factor - earliness of harvest - is extremely important to competitive strawberry growers.

CONCLUSIONS: In a market as competitive as strawberry production in New Brunswick, the "early bird gets the worm". The first berries of the season, because they are quite scarce, sell for sometimes twice the mid-season price. The use of plastic mulch in this trial allowed sizable yields to be harvested one full week earlier from the plastic-covered plots than from the other treatments.

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[8] *ppm - parts per million*

However one might still conclude, based on the results of this trial, that the straw mulch is superior to the perforated plastic in terms of berry size and yield, as well as cost **(See Table 2)**, and therefore is the best material for maximizing production and profit. The influence of the late frost on both of these factors must be taken into account though. Since strawberry plants have no physiological methods of compensating for lost blossoms, all of the blossoms taken by the frost in the plastic-treated plots became lost or non-marketable berries. Had the plastic mulch not been removed prior to the late frost, which occurred with very little warning, some of the king blossoms would have remained intact and gone on to produce larger berries and an overall greater yield. Even after losing 67% of the blossoms present at the time of the frost, the plastic-treated plants still produced a total yield insignificantly lower than the straw-mulched plants. This fact, in addition to the hastening ability of the plastic mulch, justifies further testing on fall mulch applications with greater attention to the risk of a late spring frost.

A trial is currently underway in Waterborough, New Brunswick where eight different mulches are being tested in a fall application. Irrigation will be available for frost protection. See **"Various Small Fruit Trials in New Brunswick"**, Adaptive Research Reports, N.B.D.A. 1991, Volume 13, by R.Tremblay and C.Hollis. As well, for information on using floating row covers in a spring application on strawberries, refer to **"The Spring Row Cover Advantage"**, Adaptive Research Reports, N.B.D.A.. 1991, Volume 13., by R.Tremblay and C.Hollis.

REFERENCES: Dykeman, B.W. and W.Perry. 1981. "Winter Mulching of Strawberries". Adaptive Research Reports. N.B.D.A. Vol.3, 67.

Read, G., "Mulching Strawberry Plants for Overwintering". Adaptive Research Reports. N.B.D.A. 1986. Vol.8. 23.

Tremblay, R., J. Baker, "1990 Summary Reports of Seven Small Fruit Crop Trials in New Brunswick". Adaptive Research Reports. N.B.D.A. 1990. Vol.12. 32.

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MEL SPENCER	TECHNICAL ASSISTANT
DAVID POLCHIES & CRYSTAL WARD	SUMMER STUDENTS

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THE SPRING ROW COVER ADVANTAGE

Roger Tremblay, Carolyn Hollis

ABSTRACT: A trial was carried out in Fredericton to test and compare the effects of seven different row covers in a spring application on strawberry production. The mulches were evaluated in terms of insulating qualities (as measured by a computerized temperature datalogger), amount of frost injury, earliness of harvest, berry weight and quality, total yield, and cost.

AVANTAGE DE COUVRIR LES RANGS AU PRINTEMPS

RÉSUMÉ: On a procédé à des essais à Fredericton afin d'évaluer et de comparer les effets sur le rendement de sept différents moyens de couvrir les rangs de fraisiers au printemps. On a évalué les paillis selon les critères suivants : capacité de réchauffement (selon des données enregistrées par ordinateur), dommages causés par le gel, date de la récolte, poids et qualité des fruits, rendement global et coût du paillis.

INTRODUCTION: As farming becomes more and more competitive, especially with a crop as common as strawberries in New Brunswick, being able to produce more berries earlier is a definite advantage to a grower. This is often accomplished with blanket-style row covers (mulches). However, there is such a variety of row covers differing in texture, weight, and price that it is difficult for a grower to know which one to use. Thus, this trial was established to compare seven different row covers to a non-mulched control in order to find which treatment maximizes production while minimizing cost.

MATERIALS AND METHODS: The site chosen was a level and very sheltered Veestar strawberry field planted in 1990. Plant growth was uniform except for approximately one-sixth of the field which was quite sparse with plants. The plants had been covered with a straw mulch the previous winter.

The seven row covers listed in Table 1 were cut into four sections (giving four replications) of approximately 6.5m x 10m each, with the exception of Kimberley Farms[1]-1.5 ounces which was only three metres wide, giving four 3m x 10m strips. All covers were put down on May 6 (shortly after the overwintering straw was moved to the aisles) and along with the control were arranged in a completely randomized block design (Photos 1 and 2). The datalogging equipment (one Campbell Scientific CR21[1] and two A.C.R. Systems Inc. XT-108 Stickon temperature loggers) was installed on May 9 with one probe measuring the root temperature at a 4-inch depth, and one the crown temperature for each treatment. There was also one probe

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[1] *Use of trade names in this publication is solely for identification purposes. No endorsement of the products named is implied by the N.B. Department of Agriculture, nor is discrimination intended to the exclusion of similar products named.*

TABLE 1: Minimum and Maximum Temperatures - °C

TREATMENT	CROWN				SOIL - AT A 4-INCH DEPTH			
	MINIMUM	DATE	MAXIMUM[2]	DATE	MINIMUM	DATE	MAXIMUM[2]	DATE
T1 - PLASTIC	2.17	19/05/91	37.32	25/05/91	4.98	10/05/91	36.10	25/05/91
T2 - GROMAX	0.32	10/05/91	41.70	11/05/91	5.37	10/05/91	25.54	22/05/91
T3 - KIMBERLEY FARMS 1.5 OZ. (KF 1.5)	4.19	10/05/91	32.56	26/05/91	7.28	10/05/91	23.75	26/05/91
T4 - KIMBERLEY FARMS 0.6 OZ. (KF 0.6)	4.19	10/05/91 19/05/91	32.56	11/05/91	7.96	10/05/91	21.01	25/05/91
T5 - TYPAR	3.79	10/05/91 19/05/91	38.99	10/05/91	6.52	10/05/91	26.98	10/05/91 15/05/91
T6 - AGRYL P30	1.76	19/05/91	55.40	15/05/91	2.99	10/05/91	48.21	22/05/91
T7 - AGRYL P17	5.69	10/05/91	25.89	25/05/91	6.86	10/05/91	24.07	25/05/91
T8 - NO MULCH	-0.783	10/05/91	29.79	16/05/91	5.88	10/05/91	18.43	25/05/91
AIR	MINIMUM		-3.93	19/05/91	MAXIMUM		29.08	16/05/91

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[2] *Prior to removal of all mulches.*

PHOTO 1: INSTALLING THE FLOATING MULCHES

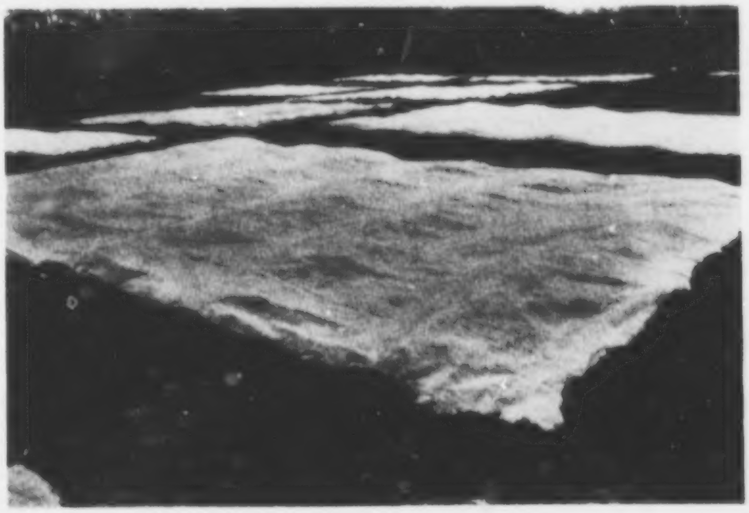

PHOTO 2: 1991 SPRING FLOATING MULCH TRIAL

measuring the air temperature in a Stevenson Screen at approximately 30 centimetres above the ground.

The covers were removed from May 29 to May 31. The amount of frost injury was evaluated by counting all the open blossoms in three randomly-chosen 1m x 0.5m sections in each rep and treatment, then counting the number of frost-injured blossoms (indicated by blackening of the pistils[3]). Leaf samples were also taken for each treatment and their nutrient levels analyzed. In early June, three 1m x 0.5m plots in each rep of each treatment were again randomly chosen, then staked out and roped in. All berries in each of these ninety-six plots were harvested between June 17 and July 18.

RESULTS AND DISCUSSION:

ALL STATISTICAL ANALYSES WERE CARRIED OUT USING ANOVA AT THE 0.05 LEVEL.

Temperature Monitoring: Refer to Table 1.

Minimum Temperatures: *All temperatures given refer to the temperature at the time specified. The majority of the minimum temperatures occurred between 6:00 and 7:00 am.*

It is important to remember that the crown level temperature would be higher in early spring than the temperature at the top of the plant canopy, where a large number of flower buds are located. Therefore frost injury could occur despite a lack of sub-zero temperatures at the crown level. This would explain why some frost-injured blossoms were found during the May 29 to 30 evaluation, even though the only sub-zero temperature ever recorded at the crown level was in the non-mulched plots, where a temperature of -0.783°C occurred on May 10. The minimum air temperature (at 30 cm above the ground) on that day was -2.16°C.

> **Figure 1 (May 17 - 21, 1991):** The datalogger did not record the minimum temperatures for the no-mulch (control) treatment from May 19 to 21, 1991. The maximum temperature for this time was recorded.
>
> **Gromax** had the lowest temperature reading at the **crown** level on May 19, 1991, at **1.15°C**. Agryl had the warmest of the minimum temperatures, at 5.76°C. The minimum air temperature on May 19 was -3.93°C.

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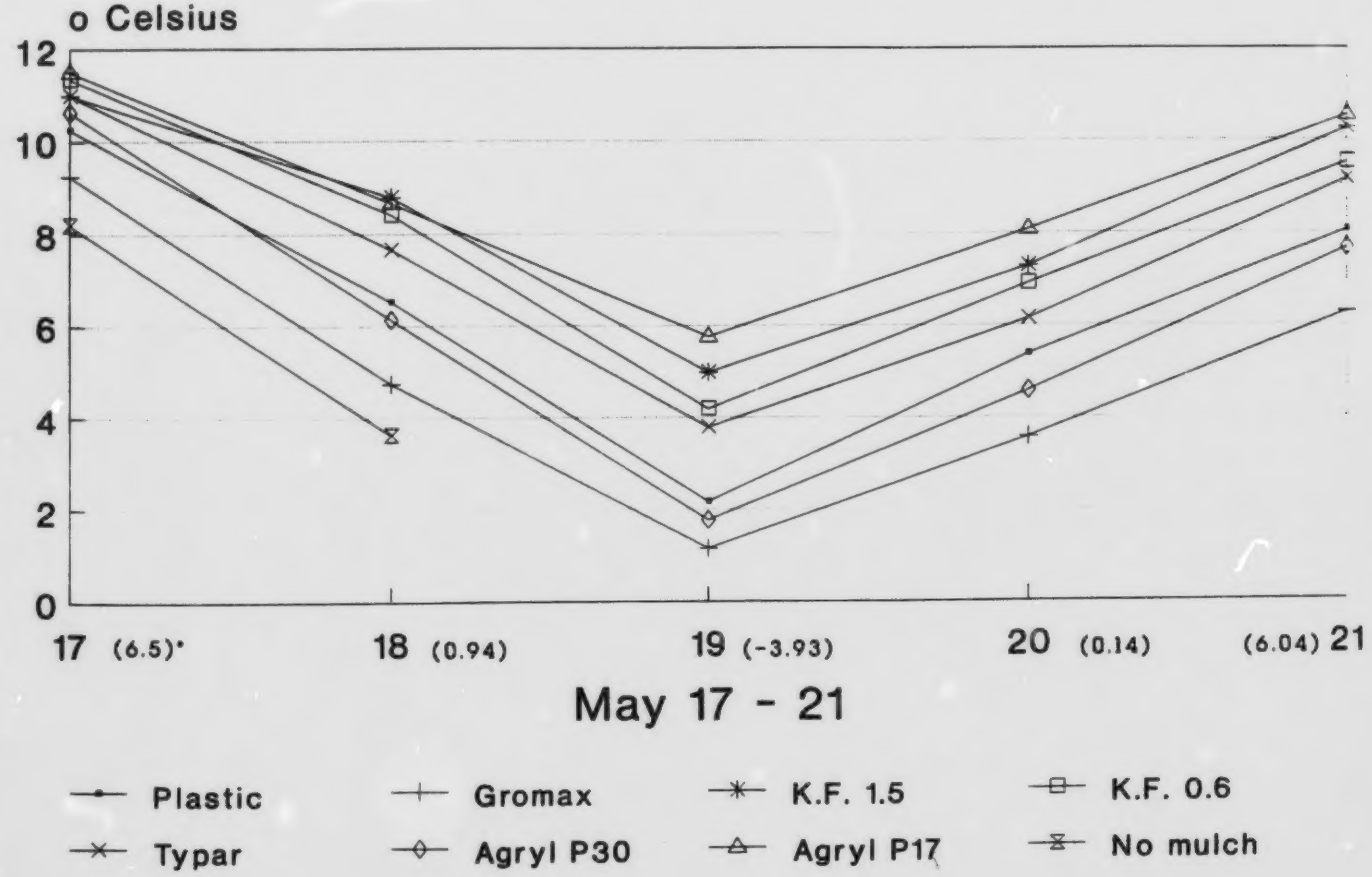
[3] *See "Frost Injury on New Brunswick Strawberries" by Tremblay and Hollis, Adaptive Research Reports, NBDA, Volume 13, 1992. Figure 1.*

FIG. 1: Minimum temperatures - Crown



Spring 91 * AIR TEMPERATURE IN DEGREE CELSIUS

Figure 2 (May 17 - 21, 1991): Agryl P30 had the coldest temperature reading at the **root** level (4-inch depth), at **2.99°C** on May 19, 1991. On the same day the minimum temperature in the Typar plots was 13.15°C, while the minimum air temperature was -3.93°C.

Maximum Temperatures: All temperatures given refer to the maximum temperature at the time specified. The majority of the maximum temperatures occurred between 2:30 and 4:00 pm.

Figure 3 (May 22 - 26, 1991): The temperature in the **Agryl P30** plots fluctuated greatly during this time period, ranging from 35.70°C to **54.80°C** at the **crown** level. The next highest temperatures were under the plastic mulch, ranging from 31.04°C to 37.32°C. The lowest of the maximums occurred in the non-mulched plots, where the temperature ranged from 22.38°C to 24.12°C.

Figure 4 (May 22 - 26, 1991): The temperature under the **Agryl P30** mulches again fluctuated the most, ranging from 35.30°C to **48.21°C** at the root level. The next warmest treatment was the plastic mulch, where the temperature ranged from 31.80°C to 36.10°C. The coolest of the maximums again occurred in the control plots, with the temperature ranging from 14.88°C to 18.43°C.

Frost Injury: **Refer to Table 2.**
Two widespread frosts occurred in New Brunswick during the time the row covers were in place - one on May 19 and one May 23 - bringing temperatures of -3.93°C and -2.54°C, respectively, to Fredericton. Those blossoms under the plastic mulch were hit hardest by this frost, while the next two greatest amounts of frost injury occurred under the two heaviest mulches - Typar and KF 1.5. The plots under the heavier covers produced blossoms earlier, so more blossoms would have been present - and therefore at risk - at the time of the frosts, giving a higher percentage of injury. The high incidence of frost injury in the plastic-treated plots could be due to greater exposure of these plants to the cold air, through the perforations.

Leaf Analysis: Strawberry leaf samples taken in early June, 1991 showed no differences in nutrient levels between the treatments. The magnesium and boron levels were low (23 ppm[4] and 24 ppm respectively) for all treatments.

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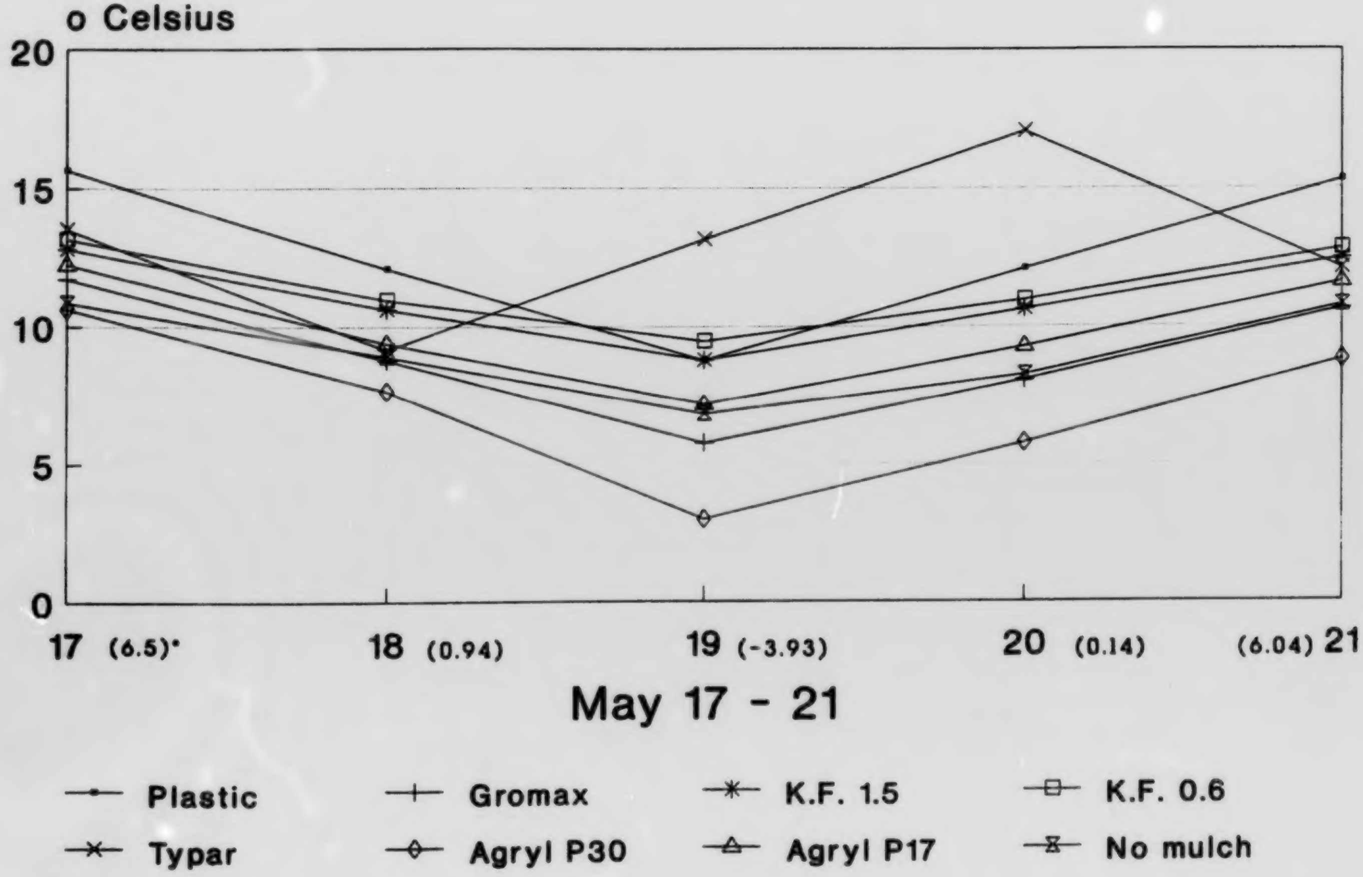
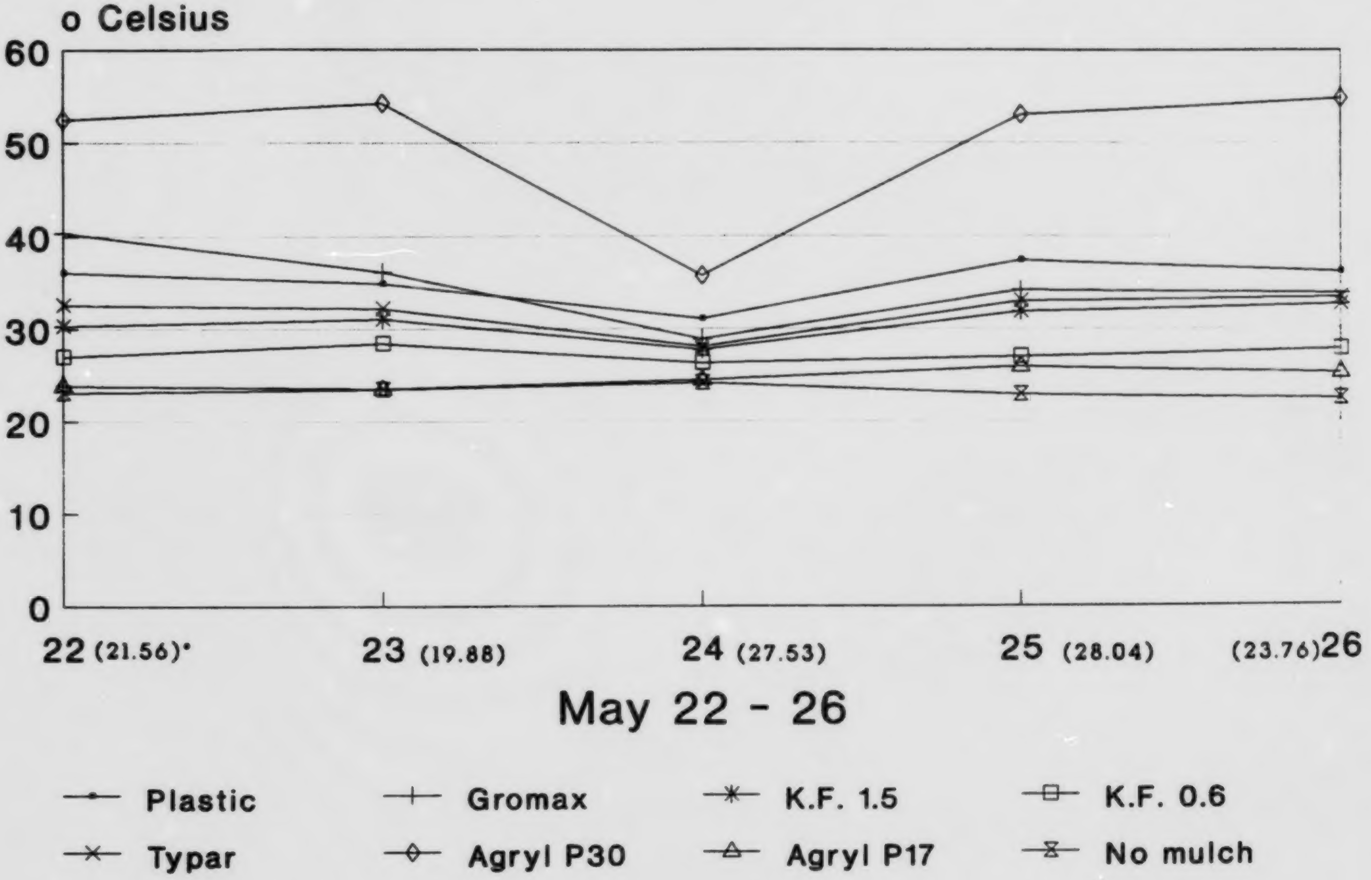
[4] *ppm - parts per million*

FIG. 2: Minimum temperatures - Soil 4"



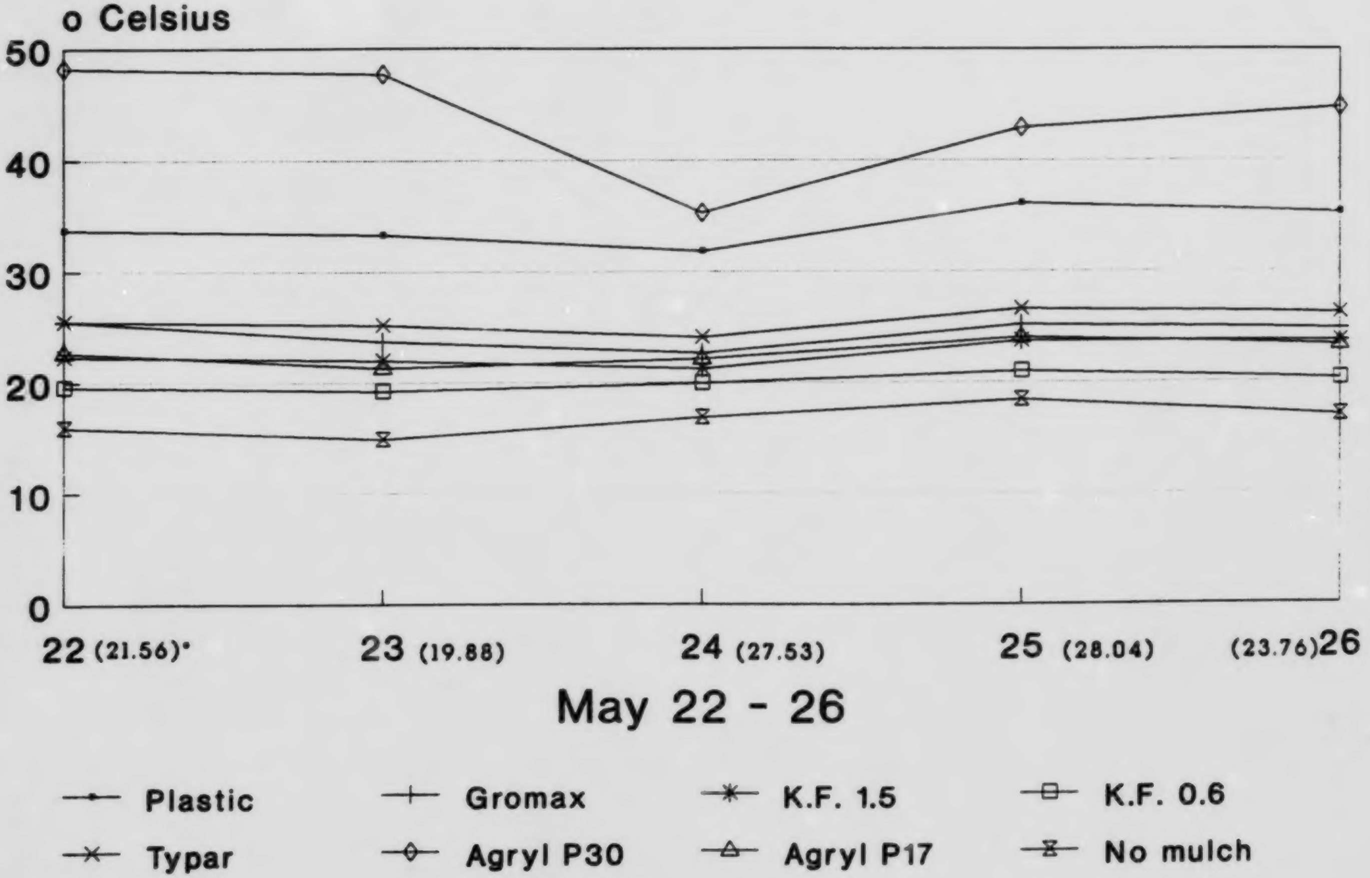
Spring 91 * AIR TEMPERATURE IN DEGREE CELSIUS

FIG. 3: Maximum temperatures - Crown



Spring 91 * AIR TEMPERATURE IN DEGREE CELSIUS

FIG. 4: Maximum temperatures - Soil 4"



Spring 91 * AIR TEMPERATURE IN DEGREE CELSIUS

TABLE 2: Comparing the Floating Mulches

TREATMENT[5]	WEIGHT OF ROW COVER (g/m^2)	FROST INJURY	AVERAGE WEIGHT PER BERRY (g)	TOTAL YIELD (kg/ha)[6]	COST (per m^2)	OVERALL RANKING
T1-PERFORATED PLASTIC	45	12.7%	4.25	19,250	$ 0.27	2
T2-GROMAX	15	2.3%	4.21	19,530	$ 0.36	1
T3-KIMBERLEY FARMS 1.5 OZ. (KF 1.5)	51	9.5%	3.73	17,290	$ 0.80	6
T4-KIMBERLEY FARMS 0.6 OZ. (KF 0.6)	20	1.2%	4.17	17,150	$ 0.40	4
T5-TYPAR	64	7.2%	3.66	13,090	$ 0.86	7
T6-AGRYL P30	30	0.8%	4.14	17,780	$ 0.50	3
T7-AGRYL P17	17	2.1%	3.91	17,080	$ 0.30	5
T8-CONTROL	--	2.1%	3.78	14,350	$ 0.00	5

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[5] *T1: Clear, perforated polyethylene with 500 holes/m^2, UV stabilized T2-T7: Spunbonded polypropylene, UV stabilized.*

[6] *Total yield including non-marketable fruit.*

Berry Weight and Quality: **Refer to Table 2.**
Berry size differed insignificantly between treatments, with the average weight ranging from 3.66 grams (Typar) to 4.25 grams (perforated plastic). There were also no correlations found between fruit quality and treatment type, with the overall average deformity ranging from 41% to 59%.

Total Yield and Earliness of Harvest: Refer to Table 2.
It must be noted that the total yields per treatment seem very high because they represent all berries harvested including the non-marketable fruit. Although the total yields for the season differed insignificantly, harvests did differ significantly between each treatment on individual picking dates. On June 20, the K.F. 1.5 and Agryl P30 plots (two of the heaviest mulches) produced the highest yields, while harvests from the control plots were minimal. By June 24 the plastic mulch plots were producing yields significantly higher than any other treatments, with the control plots still producing the least. The Gromax plots moved from producing the second lowest harvests on the first two picking dates to the second highest harvest on June 24, and remained near the top of the scale until the end of the growing season. The plants which were covered with Typar, the heaviest mulch, remained near the bottom of the scale throughout the season. The numbers panned out for all treatments from June 28 until July 12, when the yields from the mulched plots began dropping; this left the controls with significantly higher yields than the treated plots until the last picking date on July 18.

Cost: **Refer to Table 2.**
The cost per square metre of each treatment was calculated using the March 1991 prices. It closely reflects the weight of the material in all cases except the perforated plastic mulch, where the cost is much lower. Generally the heavier and stronger the cover, the more times it can be re-used. However, the perforated plastic mulch ripped very easily and could rarely be used more than once in a climate like New Brunswick's. Following one very windy spell in Fredericton, the plastic mulch on one of the reps was completely blown off the ground except for one edge, and there were many tears in all the reps of this cover. This re-usability factor is a very important one to consider not only for cost but also for environmental reasons.

CONCLUSIONS: Each treatment was ranked on a scale of 1 to 8, from best productive value to worst, on protection from frost injury, average berry weight, total yield and cost of the material. With all the rankings combined the Gromax row cover placed first. Its cost is relatively low, it offered good protection against frost injury, and the plants covered by Gromax produced the second largest berries as well as the highest total yield. The perforated plastic ranked second, however it would not be the best cover for minimizing cost in the long run since it would have to be replaced each growing season.

It might be discouraging to producers that the row covers did not result in a significantly higher yield over the uncovered controls in this spring application. However when looking at earliness of harvest, all of the treatments resulted in yields significantly larger than the controls on the second and third picking dates. This factor alone is extremely important to a grower who is trying to maximize production, considering that the earliest berries of the season often sell at twice the mid-season price.

The question which remains is whether the row covers are most advantageous when applied in the fall or in the spring. Some of the spring treatments did reach temperatures too high (eg. 55.40°C) for optimal strawberry plant development. A trial is currently underway in Waterborough where all of the row covers used in this trial are being compared to both a straw mulch and a non-mulched control in a fall application. Following next year's harvest at that site, more conclusive evidence on the row cover advantage should be available to New Brunswick strawberry growers. Refer to "Various Small Fruit Trials in New Brunswick", Adaptive Research Reports, N.B.D.A. 1991, Volume 13.

REFERENCES: Stang, E.J. Foliar Analysis for Raspberries and Strawberries. Dept.of Horticulture, University of Wisconsin. Madison, WI, 1985.

ACKNOWLEDGEMENTS: The authors would like to thank the following individuals who contributed to this trial:

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MARC ROBICHAUD	SOIL AND CLIMATE TECHNICIAN
MELVIN SPENCER	TECHNICAL ASSISTANT
DAVID POLCHIES AND CRYSTAL WARD	SUMMER STUDENTS

PLUS ALL THOSE WHO HELPED AT HARVEST TIME!

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STRAWBERRY PEST MANAGEMENT SURVEY

R. Tremblay, K. Lynch, K. McCully, C. Hollis

INTRODUCTION: In the spring of 1991, a Strawberry Pest Management Survey was mailed out to all of New Brunswick's registered strawberry growers. The purpose was to combine the information obtained from the growers so that when needed, we can supply good reliable facts on which pesticides are being used and under exactly what conditions they are applied. The survey was composed of 139 fill-in-the-blank and short-answer questions broken down into four sections. The first was a general section on crop management, yield and acreage, while the latter three contained more specific questions on herbicides, fungicides and insecticides. Included with the questionnaire was a letter explaining the purpose and the importance of completing the survey, as well as a chance to win one of three prizes with a total value of $715, to everyone returning the survey within a given deadline. Despite this incentive, there was a total of thirty-six completed surveys returned out of the two hundred mailed out.

QUESTIONNAIRE SUR LA LUTTE CONTRE LES ENNEMIS DES FRAISIERS

INTRODUCTION: Au printemps 1991, on a posté un questionnaire sur la lutte contre les ennemis des fraisiers à tous les producteurs de fraises enregistrés au Nouveau-Brunswick. Les réponses au questionnaire devaient nous permettre de fournir au besoin des données fiables sur les pesticides à utiliser et les conditions exactes d'utilisation de ces pesticides. Le questionnaire comptait 139 questions brèves ou avec des blancs à remplir et ces questions étaient réparties dans quatre sections. La première section comprenait des questions générales sur la gestion des cultures, les rendements et les surfaces ensemencées tandis que les trois autres sections portaient sur des questions plus précises ayant trait aux herbicides, aux fongicides et aux insecticides. Une lettre d'accompagnement expliquait l'importance de remplir le questionnaire, les objectifs visés et la possibilité de gagner l'un des trois prix d'une valeur globale de 715 $ si le producteur retournait le questionnaire dûment rempli avant la date limite. Malgré les prix annoncés, seulement trente-six des deux cent questionnaires postés nous ont été retournés.

ALL RAW DATA IS TABULATED IN APPENDIX 1.

SECTION 1 - GENERAL: In 1990, responding growers had an average of 2.5 acres of strawberries in production in the planting year, and 4 acres in the fruiting year. Fields were being kept in production for 3 to 4 years, and growers were taking strawberry fields out of production for an average of 3 years before replanting.

Fifty percent of the growers responding to this survey prepared their sites for planting using Round-Up, followed by 35% who used a green manure or cover crop. Rotation of pesticides was carried out by a large majority - 71% of the growers. The average yield in 1990 was 4000-5000 quarts per acre, although one grower reported a drop in yield from 4000 quarts/acre to 1500 quarts/acre due to white grubs.

It was interesting to see that the area where most growers (56%) would like help is non-chemical control, and this was followed closely (50%) by an interest in I.P.M. (Integrated Pest Management). Spraying is carried out by 52% of growers only when a certain level of infestation is reached, compared to 30% who spray on a schedule with no monitoring of levels.

Surprisingly, the majority of growers (42%) report that less than 2% of their customers asked if their berries were chemically treated, while only 21% report being asked by more than 10% of their customers. Applying pesticides caused no marketing problem for 73% of the growers responding to this survey. Only 6% reported a major marketing problem.

SECTION 2 - HERBICIDES: Out of the thirty-six growers responding to this section, thirty-three applied herbicides to their strawberries in 1990. Only three indicated that they do not use herbicides at all or did not use them in 1990, and two of these had less than one-half an acre in production. Of the eleven registered herbicides listed in the survey, two - Devrinol and Enide - were not applied by any of the respondents. Another four - Dacthal, Kerb, Tenoran and Treflan/Rival - were used by less than 20% of the growers. The three most commonly applied herbicides were Round-Up, Sinbar and Fusilade; the most popular forms of Simazine used were Princep 90% and Simadex 80% in both the planting and the fruiting years.

Looking at the herbicides overall, 27.3% of the applications were made at a lower-than-recommended rate. This was most notable in the Round-Up applications where a higher rate of at least 5.5 litres per hectare is suggested for perennial crops like strawberries in order to promote longer-lasting control. Only 2.7% of the applications were at rates above the recommended.

Of the eighteen growers who made changes to their herbicide program over the past two years, eleven added the herbicide Lontrel for control of vetch, sorrel and daisies, and were pleased with the results. Many also were pleased with Fusilade's effectiveness. Tenoran however is being dropped by many due to its poor control of stitchwort. A decrease or total cessation of herbicide use in general was indicated by 17% of the growers. Hand-weeding and cultivation are two non-chemical methods of weed control used by 94% of the growers, despite the reported average hand-weeding costs of $694 per hectare in the planting year and $360 per hectare in the fruiting year.

Herbicide applications were most commonly made using the brass flat fan nozzle, at an average pressure of 45 psi. Fifty-six percent of the growers who applied Round-Up used a surfactant with it, while 92% used a surfactant with their Fusilade applications. One grower reported using Agral 90 with their Simazine applications, which is a misuse of surfactant. Surfactants should only be used with the herbicides Round-Up and Fusilade.

SECTION 3 - FUNGICIDES: There were thirty-four respondents to this section, twenty-five of whom applied fungicides to their strawberry fields in 1990. The remaining 26% indicated they either never use fungicides or did not use them in 1990. Among this 26% the average acreage was 1.5 acres in the planting year and 2 acres in the fruiting year.

Fruit rot is the largest disease problem for growers, with 65% applying preventative sprays. The Kent variety was rated most susceptible to this disease and Honeoye the most resistant, while opinions on Veestar varied. Most growers using fungicides estimated their losses to fruit rot at 10-15%. If fungicides were not applied against this disease, growers estimated that losses would range from 5-50%.

Captan was the most commonly used control against fruit rot in 1990; Easout and Dyrene were not used by anyone. Only one application exceeded the recommended rate out of a total of seventy-four. Fungicides were applied in a volume of 1100 L/ha (100 gal/ac) or more by only one respondent. More than half (54%) use pressures of less than 690 kPa (100 psi).

Powdery mildew was a problem for only 9% of the growers, all of whom applied Benlate for control. The affected cultivars were Kent, Micmac, Annapolis and Honeoye. Fungicides for leaf spots and/or scorch were applied by 21% of the growers, most of whom applied Cyprex or Equal; Annapolis and Veestar were the most commonly affected cultivars. No fungicide was applied for the control of Red Stele.

Although 35% of the growers reported a problem with green petal and/or multiplier, this was only a minor problem with incidence highest in the Veestar and Kent cultivars.

SECTION 4 - INSECTICIDES: Out of thirty-five growers responding to this section, twenty-seven sprayed insecticides in 1990. Of the other 23% who either do not spray them at all or did not spray them in 1990, the average acreage in both the planting and the fruiting years was 1 acre; those who applied insecticides had an average of 2.6 acres in the planting year and 4.3 acres in the fruiting year. The most common problem-insect was the strawberry clipper weevil, with 57% of the growers spraying for it. Malathion and Furadan were the most popular controls applied.

Leaf tier, spittlebug, aphids and/or tarnished plant bug caused a problem for 31% of the growers, most of whom applied Thiodan 400EC/Endosulfan 400EC. Of the remaining insects listed, slugs were a problem for 14% of the growers, two-spotted spider mites for 6% and cyclamen mites for 23%. Thiodan 400EC/Endosulfan 400EC was used against the cyclamen mite by 90% of the growers, compared to only 10% who applied Thiodan 50WP/Endosulfan 50WP.

CONCLUSIONS: Only 18% of the mailed-out surveys were returned, despite the importance of obtaining this information and the incentives offered. This is disappointing but not surprising, as past experience had warned us that higher return rates require a personal interview format. We do realize that the survey was mailed out during a very busy period for the growers. Of the questionnaires returned, many were not completed in full. For instance in some cases an entire section would be left out, leaving us to wonder if the grower did not use that type of pesticide or did not complete that section for other reasons such as time or confidentiality. Whether the results are biased by a certain type of producer being more likely to return the survey is unknown.

There is a need for better pest identification techniques by the growers. The fact that 23% of producers indicated a problem with cyclamen mites is worth noting, since many fail to recognize this insect in the field. The importance of some pests, such as tarnished plant bug, may be underestimated since good monitoring and damage assessment techniques for these pests are not fully developed. The use of low volumes and pressures in some pesticide applications indicate that more information is required by producers on efficient methods of delivering the pesticide to the crop.

The information obtained from this survey shows that the majority of growers are concerned about pesticide usage, and are interested in learning more about alternative control methods such as IPM. However, the high cost of hand-weeding indicates that for a grower to significantly reduce herbicide use while remaining competitive will be difficult. The number of growers indicating problems with fruit rot and strawberry clipper weevil also emphasizes the importance of having effective pesticides available for these problems. The recorded instances of improper use were very small and most respondents were very knowledgeable on the products available for use. Combining all of the pesticide applications made where the rates used were indicated, only 3.0% were made at above-recommended rates.

The authors would like to thank those growers who did respond to the survey. Now that we know the pest management techniques being practised, we can concentrate our efforts on those areas with which growers need more assistance, working together for more efficient and safe pest control methods.

Congratulations are extended to the prize winners, as follows:

FIRST PRIZE: 5000 STRAWBERRY PLANTS:
JAMES P. MONIER, Bass River

SECOND PRIZE: ONE YEAR SUBSCRIPTION TO THE NORTH AMERICAN STRAWBERRY GROWERS ASSOCIATION:
EMERY BELYEA, Young's Cove Road

THIRD PRIZE: 3000 STRAWBERRY PLANTS:
ALLIE POWER, Bathurst

ACKNOWLEDGEMENTS: Thanks are extended by the authors to Julie Baker, Horticultural Technician, for her work in compiling the questionnaire.

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APPENDIX I: STRAWBERRY PEST MANAGEMENT SURVEY RESULTS

SECTION 1 - GENERAL SECTION:

TOTAL # RESPONDING TO SECTION 1: 35

1. How have you prepared your sites for planting?

PREPARATION	1989	1990
Green Manure or Cover Crop	17	12
Fumigation	1	1
Summer Fallow	9	10
Round-Up	13	17
Other	5	5

# RESPONDENTS: 34

2. Do you rotate your pesticides?

YES	NO
22	9

RESPONDENTS: 31

3. After a field has been removed from strawberries, how many years before you normally replant strawberries in this field?

1 yr	2 yrs	3 yrs	4 yrs	5 yrs	>5 yrs
4	6	11	2	2	3

RESPONDENTS: 28

4. What was your average yield in 1990?

pounds/acre							
0	3000+	4000+	5000+	6000+	7000 +	8000-9000	10,000 +
1	2	7	5	2	6	3	3

RESPONDENTS: 29

5. How many acres/hectares did you have in production in 1990?

planting year - acres									
<1	1+	2+	3+	4+	5+	6+	7+	8+	9-10
6	8	5	3	3	2	0	1	1	1

fruiting year - acres									
<1	1+	2+	3+	4+	5+	6+	7+	8+	9-10
4	3	5	4	5	5	1	0	3	3

RESPONDENTS: 34

6. Would you like more help with one or more of the following areas?

AREA	**NUMBER INTERESTED**
weed identification	11
herbicide control	13
non-chemical control	18
insects	15
pesticide handling	2
pesticide application	3
Integrated Pest Management	16
scouting	13
fruit rot control	8
leaf diseases	10
other diseases, which one?	*Verticillium Wilt* *Winter Damage* *Disposal of Herbicide Containers* *Pest/Weed Thresholds*

RESPONDENTS: 32

7. Are there any pesticides you would like to see registered for strawberries?

NAME OF PESTICIDE	**NUMBER REQUESTING**
Bravo	1
Captan	1
Equal	1

RESPONDENTS: 2

8. What pests do you have the most trouble controlling?

PEST	NUMBER REPORTING	PEST	NUMBER REPORTING
Toadflax	2	*Weevils*	5
Stitchwort	1	*Mites*	5
Grasses	1	*Tarnished Plant Bug*	1
Horsetail	1	*Leaf Roller*	1
Hedgenettle	1	*Cut Worms*	1
Southern Thistle	1	*Nematodes*	1
Vetch	1	*Fruit Flies*	1
Sheep Sorrel	1	*Grubs*	1
General Weeds	1	*Slugs*	2
Leaf Diseases	1	*Beetles*	2

RESPONDENTS: 20

9. What is the most common soil texture of your strawberry fields?

SAND	LOAM	CLAY
8	26	5

RESPONDENTS: 35

10. How long do you generally keep your fields in production?

1 year	2 years	3 years	4 years	5 years	6 or more
1	6	9	13	2	1

RESPONDENTS: 32

11. What percent of your customers ask if pesticides are applied on your strawberries?

0-2%	3-5%	6-10%	11-20%	21-40%	41-50%
14	4	8	2	3	2

RESPONDENTS: 33

12. Does applying pesticides cause a marketing problem?

MAJOR	MINOR	NONE
2	7	24

RESPONDENTS: 33

13. For insects, mites and leaf diseases do you spray:

WHEN PESTS ARE FIRST NOTICED	11
AT A CERTAIN LEVEL OF INFESTATION	14
ON A SCHEDULE (NO MONITORING)	8

RESPONDENTS: 27

Additional Comments

One producer prepared their site for planting by grazing of a cover crop in both 1989 and 1990.

Some producers expressed that the length of time a field is kept in production as well as the number of years a field is kept out of strawberry production, depends greatly on the problems experienced in that field. For instance, one stated that he may replant strawberries in one year or he may wait five to seven years before replanting, due to field conditions.

One producer's average yield in 1990 dropped from 4000 quarts per acre to 1500 quarts per acre where there was white grub damage. They also noted that their new field which was taken out of sod for a few years before planting strawberries has no white grub damage.

It was suggested by one producer that it would be useful if economic thresholds were known for the densities of the common weed, fungus and insect pests. Another stated that he was unable to identify any specific pests.

Many producers described their soil texture as a combination of types, such as "sandy-loam" or "clay-loam". In these cases, both types were tabulated for that producer.

Early in the season spraying is done on a schedule, while later during the harvest it is done when a certain level of infestation is reached, by one producer.

SECTION 2 - HERBICIDES:

TOTAL # RESPONDING TO SECTION 2: 36

Total # spraying herbicides in 1990: 33

Total # **indicating** that they do not spray herbicides, or did not spray them in 1990 = 3

A. Round-Up 356 g/L (glyphosphate)

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 31

TOTAL # USING ROUND-UP: 26

TOTAL # INDICATING THEY DID NOT USE ROUND-UP 356g/L: 5

YEAR BEFORE PLANTING			RATES (L/HA)	PLANTING YEAR
Spring	Summer	Fall		Spring
4	1	4	<2.5	1
	4	2	2.5	
1	3	2	2.5 - 5.5	
2		2	5.5 - 9.0	1
			>9.0	

Respondents: 23

1. What water volume are you applying Round-Up in? (in gal/acre):

6 - 20	22 - 30	35 - 50	100
4	6	5	4

Respondents: 19

2. Did you apply spot treatments of Round-Up?

YES	NO
11	15

Respondents: 26

3. If yes, at what concentration and how did you apply it?

CONCENTRATION	# USING	METHOD OF APPLICATION	# USING
0.6% - 1%	3	Back Pack Sprayer	1
2%	1	Hand Sprayer	1
3%	1	Sideswipe Application	2
33%	2	Paint Brush	1

Respondents: 8

4. Did you use a surfactant (eg. Agral 90) with Round-Up?

YES	NO
9	16

Respondents: 25

5. If yes, which one?

AGRAL 90	SUPER-SPREADER-STICKER
6	1

Respondents: 7

6. What was your surfactant rate?

0.01%	0.08%	0.1 - 0.2%	0.44%
1	1	3	1

Respondents: 6

7. What is the total area you apply Round-Up on? (in acres)

< =0.5	1-1.9	2-2.9	3-3.9	4-4.9	5-5.9	6-8
5	4	6	2	2	3	3

Respondents: 25

B. Dacthal 75WP

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 17

TOTAL # SPRAYING DACTHAL 75WP: 2

TOTAL # INDICATING THEY DID NOT USE DACTHAL 75WP: 15

1. What is the total area you apply Dacthal on? (in acres)

Fruiting year - no one indicated acreage

Planting year:

1 ACRE	*3 ACRES*
1	*1*

# Respondents: 2

PLANTING YEAR			*RATES APPLIED (kg/ha)*	*FRUITING YEAR*			
Early Spring	Late Summer	Fall		Spring	Renovation	Late Summer	Fall
1			<11.75	1	1		
1			11.75 - 13.0				
			13.0 - 14.25				
			>14.25				

# Respondents: 2

2. What water volume are you applying Dacthal in? (in gal/acre)
100 gal/acre
Respondents: 1

C. Devrinol 50WP

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 14

TOTAL # SPRAYING DEVRINOL 50WP: 0

TOTAL # INDICATING THEY DID NOT USE DEVRINOL 50WP: 14

D. Enide 50WP

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 15

TOTAL # SPRAYING ENIDE 50WP: 0

TOTAL # INDICATING THEY DID NOT USE ENIDE 50WP: 15

E. Kerb 50WP

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 17

TOTAL # SPRAYING KERB 50WP: 5

TOTAL # INDICATING THEY DID NOT USE KERB 50WP: 12

PLANTING YEAR	RATES APPLIED (KG/HA)	FRUITING YEAR
LATE FALL		LATE FALL
1	<2.2	1
	2.2	3
	>2.2	

# Respondents: 5

1. In the planting year what was the total area you applied Kerb on? (in acres)

0 ACRES	4 ACRES
3	1

# Respondents: 4

2. In the fruiting year what was the total area you applied Kerb on? (in acres)

0 ACRES	1 ACRE	2 ACRES	3 ACRES
1	1	1	1

# Respondents: 4

3. What weeds are you trying to control with Kerb?

Common Grasses	*2*
Quack Grass	*1*
Barnyard Grasses	*1*
Sorrel	*1*

# Respondents: 4

4. What water volume do you apply Kerb in? (in gal/ac)

30 GAL/ACRE	35 GAL/ACRE	45 GAL/ACRE
1	1	1

# Respondents: 3

F. Fusilade 250EC

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 23

TOTAL # SPRAYING FUSILADE 250EC: 14

TOTAL # INDICATING THEY DID NOT USE FUSILADE 250EC: 9

PLANTING YEAR			RATES APPLIED (L/HA)	FRUITING YEAR		
SPRING	SUMMER	FALL		SPRING	SUMMER	FALL
			<0.8	1		
	1		0.8-1.0	2		
	1		1.0-1.9		1	
			2.0	6	1	
			>2.0			

Respondents: 12

1. In the planting year what was the total area you applied Fusilade on? (in acres)

0 ACRES	1.5 ACRES	2.5 ACRES	4 ACRES
4	1	1	1

Respondents: 7

2. In the fruiting year what was the total area you applied Fusilade on? (in acres)

0	0.25 - 1	2 - 2.5	3	5	10 - 12.5
1	2	5	1	1	1

Respondents: 11

3. What grasses are you trying to control?

GRASS	# GROWERS	GRASS	# GROWERS
Quack Grass	*7*	*Crab Grass*	*1*
Couch Grass	*3*	*Common Grasses*	*1*
Barnyard Grass	*3*	*Clover*	*1*
Flat Grass	*1*	*All Grasses*	*1*

Respondents: 13

4. Do you use a surfactant (eg. Agral 90) with Fusilade?

YES	NO
12	1

Respondents: 13

5. If yes, which one?

AGRAL 90	SUPER-SPREADER-STICKER
8	1

Respondents: 9

6. What water volume do you apply Fusilade in? (in gal/acre)

20	30	45	50	85	100
2	2	1	1	1	1

Respondents: 8

G. 2,4-D Amine 500

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 18

TOTAL # SPRAYING 2,4-D AMINE 500: 10

TOTAL # INDICATING THEY DID NOT SPRAY 2,4-D AMINE 500: 8

PLANTING YEAR	RATES APPLIED (L/HA)	FRUITING YEAR
SPRING		RENOVATION
1	<2.0	1
	2.0	7
	>2.0	1

Respondents: 9

1. In the planting year what was the total area you applied 2,4-D on? (in acres)

O ACRES	2.5 ACRES
3	2

Respondents: 5

2. In the fruiting year what was the total area you applied 2,4-D on? (in acres)

0	2	4	5	8.5	12.5
1	2	2	1	1	2

Respondents: 9

3. What water volume do you apply with 2,4-D? (in gal/acre)

15 - 25	30 - 35	45 - 50	100
3	2	2	2

Respondents: 9

H. Simazine

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 24

TOTAL # SPRAYING SIMAZINE: 13

TOTAL # INDICATING THEY DID NOT SPRAY SIMAZINE: 11

PLANTING YEAR:

Total # spraying in the planting year: 10

PRODUCT AND/OR ACTIVE INGREDIENT	# USING IT
Princep 90% or Simmaprin Nine-T 90%	4
Simadex 80%	4
Simadex 500g/L	1

Respondents: 9

PRINCEP 90% OR SIMMAPRIN NINE-T 90%			RATE APPLIED (KG/HA)
EARLY SPRING	LATE SUMMER	LATE FALL	
		1	<0.55
	1		0.55
		2	0.56 - 1.2
	1	1	1.21 - 1.5
			1.51 - 1.8
			>1.8

Respondents: 4

SIMADEX 80%			RATE APPLIED (KG/HA)
EARLY SPRING	LATE SUMMER	LATE FALL	
1	2		<0.625
			0.625
	1	1	0.626 - 1.4
		1	1.4 - 1.7
		1	1.71 - 2.0
			>2.0

Respondents: 4

SIMADEX 500G/L

- One producer indicated that he was spraying this at a rate of 1.1 - 2.2 L/ha, but did not indicate the time of year it was applied.

1. What water volume do you apply Simazine in? (in gal/acre)

20	30 - 35	50	100
1	4	1	1

Respondents: 7

2. In the planting year what was the total area you applied Simazine on? (in acres)

0	0.6 - 1.9	2.5	5
1	2	3	1

Respondents: 7

SIMAZINE (CONTINUED)

FRUITING YEAR:

Total # spraying in the fruiting year: 11

PRODUCT AND/OR ACTIVE INGREDIENT	# USING IT
Princep 90% or Simmaprin Nine-T 90%	4
Simadex 80%	4
Simadex 500g/L	1

Respondents: 9

PRINCEP 90% OR SIMMAPRIN NINE-T 90%			RATE APPLIED (KG/HA)
EARLY SPRING	AFTER RENOV.	LATE FALL	
1	1	1	<0.9
	2	2	0.9 - 1.0
			1.1 - 1.19
			1.2 - 1.29
			1.3 - 1.49
			1.5 - 1.8
			>1.8

Respondents: 4

SIMADEX 80%			RATE APPLIED (KG/HA)
EARLY SPRING	AFTER RENOV.	LATE FALL	
			<1.0
	1		1.0 - 1.24
			1.25 - 1.35
	2	1	1.36 - 1.49
		1	1.5 - 1.69
		1	1.7 - 2.0
			>2.0

Respondents: 4

SIMADEX 500 G/L

- One producer indicated that he was spraying this at a rate of 2.0 - 2.19 L/ha, but did not indicate the time of year it was applied.

1. What water volume are you applying Simazine in? (in gal/acre)

25	30 - 35	200
1	3	1

Respondents: 5

2. In the fruiting year what was the total area you applied Simazine on? (in acres)

0.5	**2.5 - 3**	**4 - 5**	**7**	**9 - 10**
1	2	5	1	1

Respondents: 9

3. What is your soil pH? (for fields you use Simazine on)

5.0 - 5.4	**5.5 - 6.0**	**6.1 - 6.7**
3	4	1

Respondents: 7

I. Sinbar

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 27

TOTAL # SPRAYING SINBAR: 20

TOTAL # INDICATING THEY DID NOT SPRAY SINBAR: 7

PLANTING YEAR[1]

EARLY SPRING (4-6 WKS. AFTER PLANTING)		**LATE SUMMER**		**LATE FALL**	
<0.275	3	**<0.18**	1	**<0.65**	3
0.275-0.41	4	**0.18-0.239**	1	**0.65-0.74**	4
0.41-0.55	3	**0.24-0.3**	4	**0.75-0.85**	3
>0.55	1	**>0.3**	1	**>0.85**	

Respondents: 14

FRUITING YEAR

EARLY SPRING		**AFTER RENOVATION**		**LATE FALL**	
<0.275		**<0.66**	3	**<0.65**	
0.275-0.31		**0.66-0.749**	4	**0.65-0.749**	5
0.32-0.35	1	**0.75-0.84**	5	**0.75-0.85**	4
>0.35		**>0.84**		**>0.85**	1

Respondents: 15

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[1] Tabular data in kg/ha.

1. In the planting year what was the total area you applied Sinbar on? (in acres)

0	0.5 - 1.5	2 - 3	4 - 5	20
1	7	4	4	1

Respondents: 17

2. In the fruiting year what was the total area you applied Sinbar on? (in acres)

0	0.5	2 - 3	4	5 - 6	8.5
1	1	2	6	4	1

Respondents: 15

3. What cultivars are you applying Sinbar on?

CULTIVAR	#	CULTIVAR	#
Veestar	*16*	*Bounty*	*3*
Kent	*13*	*Cavendish*	*3*
Honeoye	*8*	*Annapolis*	*2*
Blomidon	*8*	*Cornwallis*	*2*
Glooscap	*6*	*Redcoat*	*1*
Micmac	*4*	*Sparkle*	*1*

# Respondents: 18

4. What volume of water do you apply Sinbar in? (in gal/acre)

15 - 22	30 - 35	50	70	90	200
3	6	2	1	1	1

Respondents: 14

J. Tenoran

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 20

TOTAL # SPRAYING TENORAN: 6

TOTAL # INDICATING THEY DID NOT SPRAY TENORAN: 14

PLANTING YEAR		RATES APPLIED (KG/HA)	FRUITING YEAR			
EARLY SPRING	LATE SUMMER		EARLY SPRING	RENO-VATION	LATE SUMMER	EARLY FALL
3	1	<9.0				
2		9.0-11.25				1
		11.25-13.0				
		>13.0				

Respondents: 6

1. In the planting year what was the total area you applied Tenoran? (in acres)

1 ACRE	2 ACRES	4 ACRES	5 ACRES
1	1	1	1

Respondents: 4

2. In the fruiting year what was the total area you applied Tenoran on? (in acres)
1.25 acres
# Respondents: 1

3. What volume of water do you apply Tenoran in? (in gal/acre)

22 - 27	45	100	300
2	1	1	1

Respondents: 5

K. Treflan/Rival (Trifluralin)

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 18

TOTAL # SPRAYING TREFLAN/RIVAL: 7

TOTAL # INDICATING THEY DID NOT SPRAY TREFLAN/RIVAL: 11

BEFORE PLANTING (PPI) (PRE-PLANT INCORPORATED)	RATES APPLIED (L/HA)
1	<1
1	1.0 - 1.6
5	1.6 - 2.2
	>2.2

Respondents: 7

1. What volume of water do you apply Treflan in? (in gal/acre)

20 - 25	30 - 35	50	65
2	3	1	1

Respondents: 7

2. In the planting year what was the total area you applied Treflan on? (in acres)

0.5	2	2.5	3
2	1	3	1

Respondents: 7

3. What equipment do you incorporate Treflan with?

Harrow	*3*
Disc	*2*
Rotorator	*1*
Vibrashank	*1*

Respondents: 7

4. How deep do you incorporate it?

1-2 inches	4-5 inches	6-8 inches	10-12 inches
2	1	2	1

Respondents: 6

5. Do you incorporate Treflan?

YES	NO
7	0

Respondents: 7

6. If yes, do you incorporate with;

ONE PASS	1
TWO PASSES IN THE SAME DIRECTION	1
TWO PASSES IN DIFFERENT DIRECTIONS	5

Respondents: 7

GENERAL QUESTIONS ABOUT HERBICIDES:

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 35

1. Have you made changes to your herbicide program over the past two years, i.e.; discontinued or added a herbicide.

YES	NO
18	15

Respondents: 33

2. If yes, please list the changes:

CHANGES MADE	# MAKING THIS CHANGE
Added Lontrel	*11*
Added Fusilade	*4*
Added Sinbar	*2*
Added Tenoran	*1*
Added Treflan	*1*
Added Round-up	*1*
Added surfactant to herbicides	*1*
Decreasing use of herbicides in general	*3*
Stopped or decreased using Tenoran	*3*
Stopped using Kerb	*3*
Stopped using Simazine	*1*
Using Sinbar only in late fall	*1*

Respondents: 18

3. Why did you make these changes?

REASON FOR MAKING THE CHANGE (general comments)	**# GIVING THIS REASON**
Lontrel as control for vetch	*8*
Lontrel as control for sorrel	*6*
Lontrel as control for daisies	*4*
Better coverage with Sinbar	*1*
Fusilade was added for Quackgrass control	*2*
Tenoran was suggested by the weed specialist for stitchwort	*1*
Fear of using/desire to not use chemical control	*3*
Tenoran caused injury to crop and/or was ineffective control	*2*
Simazine caused injury to crop	*1*
Sinbar damaging in summer but not late fall	*1*

Respondents: 14

4. Are you practising one or more of the following weed control methods?

HAND WEEDING	33
CULTIVATION	33
OTHER PRACTICES	*Spot Treatment with Round-Up - 4* *Black Plastic Mulch - 2* *Hoeing - 2* *Grazing of Cover Crop - 1* *Renovation with Tiller - 1*

Respondents: 35

5. What are your hand weeding costs? (in dollars/acre)
PLANTING YEAR

0	**35-50**	**100-150**	**200-250**	**300-400**	**450-500**	**600-800**
1	2	8	4	7	2	3

Respondents: 27

FRUITING YEAR

0	10 - 25	50 - 80	100-125	200	400	500
2	4	3	3	4	1	1

Respondents: 18

6. Have you applied any herbicide tank mixes over the past two years?

YES	NO
9	23

Respondents: 32

7. If yes, what were the tank mixes?

Sinbar/Simazine	*2*
Sinbar/Lontrel	*1*
Sinbar/2,4-D Amine	*1*
Sinbar or Simazine/Kerb	*1*
Sinbar/Simazine/Round-up	*1*
Simazine/Princep	*1*
Round-up/Fusilade	*1*
Captan/Kelthane	*1*

Respondents: 9

8. How often do you calibrate your sprayer?

NEVER	ONCE	ONCE/ 2 YRS	ONCE/ YR	TWICE/ YR	THREE TIMES/YR	EVERY SPRAY
1	1	1	14	8	1	5

Respondents: 31

9. What is the pressure at which you spray herbicides? (in psi)

5-10	20-30	31-44	45-50	60-75	100	150-200
1	11	9	6	2	2	1

Respondents: 32

10. What type of nozzles do you use to spray herbicides?

FLAT FAN	27
HOLLOW CONE	4
OTHER	*Tee-jet - 2*

# Respondents: 31

11. What are the nozzles made of?

BRASS	15
STAINLESS STEEL (SS)	9
HARDENED STAINLESS STEEL (HSS)	5
PLASTIC	7
OTHER	*Steel - 1* *Ceramic - 1*

# Respondents: 31

12. Are you using surfactants, (eg. Agral 90) with herbicides other than Round-Up and\or Fusilade?

YES	**NO**
1	26

Respondents: 27

13. If yes, which surfactants are you using with which herbicides?
- Agral 90 with Simazine

# Respondents: 1

Additional Comments

The information in the preceding summary applies only to those herbicides used in 1990. However, some producers did include data on their applications from previous years; this as well as some of their comments will be noted here.

1. Round Up:
   One producer does not use Round Up because he finds the price high, and the herbicide ineffective.

   One producer who did not spray Round Up in 1990, did spray four acres in the fall of 1988 - the year before planting - at a rate of [5.5 - 9.0 L/ha], with no surfactant. They did not apply spot treatments of Round Up.

2. Enide:
   This was sprayed in the fall of 1989 in the fruiting year, at a rate of [<9.0 kg/ha], by a producer who did not spray Enide in 1990.

3. Kerb:
   This was sprayed in the late fall of both the planting and the fruiting year, on two acres each time, at a rate of [<2.2 kg/ha] in previous years but not 1990, by one producer.

   Another producer who did spray Kerb in 1990 expressed that, being new at strawberry growing, they didn't know which weeds the herbicide would control - but they sprayed it in the late fall of the fruiting year at a rate of [<2.2 kg/ha].

4. Fusilade:
   Fusilade was used to control Couch Grass by one producer in 1989 but not 1990. It was sprayed in the spring of the fruiting year at a rate of [2.0 L/ha], on five hectares (twelve and one-half acres).

5. Simazine:
   A number of producers completed this section incorrectly, usually by indicating the rate but not the type of Simazine product used. Any information which could be used was included in the summary, the rest ignored.

6. Sinbar:
   One producer indicated that Sinbar was sprayed on three and one-half acres of Kents and Glooscaps int the fall of 1989, but did not include the rate used.

GENERAL SECTION:

Many producers were pleased with the effectiveness of Lontrel against vetch, daisies, and sorrel. As well, Fusilade was described as an effective herbicide. Tenoran was found by quite a few producers to be a poor control for stitchwort, and is being dropped by many. One producer stated that they will probably replace Tenoran with Dacthal in 1992.

One organic producer noted that using black plastic mulch creates better growing conditions for the strawberry plants, but of course requires more hand time. This producer has been experimenting with the mulch for the last three years. He claims that without the black plastic, organically grown berries will only fruit for one year, as compared to two or more years with the mulch.

Some producers indicated that they do their own hand weeding, and so did not calculate a cost. The man-hours per acre were estimated at one-hundred by one producer.

SECTION 3 - FUNGICIDES:

TOTAL # RESPONDING TO SECTION 3: 34

Total number spraying fungicides in 1990 = 25

Total number **indicating** that they do not spray fungicides, or did not spray them in 1990 = 9

A. Fruit Rot
TOTAL # RESPONDENTS IN THIS SUB-SECTION: 29

TOTAL # SPRAYING FOR FRUIT ROT: 22

Except for those questions marked with an asterisk (*), the data below refers only to those who are spraying fungicides.

1. What was the total area you sprayed last year for fruit rot? (in acres)

0 - 1.9	2 - 3.9	4 - 5.9	6 - 7.9	8 - 9.9	10 - 12
3	3	9	2	2	3

Respondents: 22

2. How many sprays did you apply during bloom?

0	1	2	3
3	5	10	4

Respondents: 22

3. How many sprays did you apply after bloom?

0	1	2	3
10	7	3	2

Respondents: 22

4. Did you apply fruit rot sprays during harvest?

YES	NO
3	18

Respondents: 21

5. What percent of your yield do you lose to fruit rot?

0 - 4	5 - 10	11 - 15
7	16	1

Respondents: 24

6.* What percent would you lose if you did not spray?

0 - 4	5 - 10	11 - 20	21 - 49	50 +	?
2	5	4	4	4	9

Respondents: 28

7.* Which varieties do you have the greatest amount of fruit rot on?

CULTIVAR	# REPORTING THIS
Kent	*8*
Veestar	*7*
Micmac	*3*
Redcoat	*3*
Bounty	*2*
Annapolis	*1*
Blomidon	*1*

Respondents: 19

8.* Which varieties seem to have the least amount of fruit rot?

CULTIVAR	# REPORTING THIS
Veestar	*6*
Honeoye	*6*
Annapolis	*4*
Glooscap	*4*
Kent	*2*
Blomidon	*2*
Cavendish	*1*
Bounty	*1*

Respondents: 19

FUNGICIDES USED IN 1990 TO CONTROL FRUIT ROT:

SPRAY	**# USERS**	**RATE**		**# OF APPLICATIONS**				
		RECOMMENDED[2]	**OTHER**	**1**	**2**	**3**	**4**	**5**
Captan 50WP	3	2	1			1		
Captan 80WP	14	12	6kg/ha; 2.5kg/ha	4	1	4		1
Easout 70WP	0							
Rovral 50WP	7	7		3	3			
Dyrene 50WP	0							
Benlate 50WP	5	5		2				
Benlate + Captan (Tank Mix)	11	8	Benlate 1.1kg/ha with Captan 3.35 kg/ha; Benlate 0.3kg/ha with Captan 2.5 kg/ha	3	3	3		
Others:	0							

Respondents: 21

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[2] Recommended rates: Captan 50WP - 6.75 kg/ha; Captan 80WP - 4.25 kg/ha; Easout 70WP - 1.1 kg/ha; Rovral 50WP - 2.0 kg/ha; Dyrene 50WP - 3.25 kg/ha; Benlate 50WP - 1.1 kg/ha; Benlate + Captan (Tank Mix) - 1.1 kg/ha Benlate + 6.74 kg/ha Captan.

B. Powdery Mildew

TOTAL NUMBER RESPONDENTS IN THIS SUB-SECTION: 24

1. Did you have to apply sprays for powdery mildew control last year? If yes, how many?

YES	NO	1 SPRAY	2 SPRAYS
3	19	2	1

Respondents: 22 # Respondents: 3

2. Which fungicide(s) did you use?

Benlate 50WP (1.1 kg/ha)	5
Wettable Sulphur (4.5 kg/ha)	0

Respondents: 5

3. What varieties do you have to spray for powdery mildew?

CULTIVAR	# REPORTING THIS
Kent	*2*
Micmac	*2*
Annapolis	*2*
Honeoye	*2*
Blomidon	*1*
All	*1*

Respondents: 5

C. Leaf Spots and Leaf Scorch

TOTAL NUMBER RESPONDENTS IN THIS SUB-SECTION: 26

1. Other than the sprays you apply for fruit rot control, do you apply and additional sprays for leaf spot or scorch control? How many?

YES	NO	1 SPRAY	2 SPRAY
7	16	3	2

Respondents: 23 # Respondents: 5

2. Which fungicides do you use?

Cyprex or Equal	8
Captan	1
Benlate	1
Easout	0
Rovral	0
Dyrene	0
Captan + Benlate	0
Other:	0

# Respondents: 9

3. Indicate the varieties that have the most problem with leafspots and scorch:

CULTIVAR	**# REPORTING THIS**
Annapolis	*3*
Veestar	*3*
Blomidon	*2*
Kent	*1*
Glooscap	*1*
All	*1*

# Respondents: 8

D. Red Stele

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 27

1. Did you apply Ridomil for Red Stele control last fall?

NO	**YES**
27	0

# Respondents: 27

2. Number of applications: N/A

E. Green Petal and Multiplier

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 27

1. Do you have a problem with either of these two diseases?

NO	YES
15	12

Respondents: 27

2. Which varieties seem to have the most problem with these diseases?

CULTIVAR	# REPORTING THIS
Veestar	7
Kent	5
Annapolis	3
Honeoye	3
Glooscap	2
Cavendish	1
Redcoat	1

Respondents: 12

3. These diseases are a ________ problem:

MINOR	17
SEVERE	2

Respondents: 19

F. General Section

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 29

1. Did you apply any tank mixes other than Captan + Benlate? This includes tank mixes of Fungicides and Insecticides.

NO	YES
16	11

Respondents: 27

What were the mixes?

MIX	**# USING IT**
Captan/Malathion	*4*
Captan/Thiodan or Diazinon	*2*
Captan/Rovral	*1*
Captan/Lorsband	*1*
Captan/Benlate/Thiodan	*1*
Captan/Thiodan EC/Malathion liquid	*1*
Benlate or Captan/Guthion or Furadan	*1*
Rovral/Equal	*1*
Rovral/Thiodan	*1*
Sinbar/Lontrel	*1*
Kelthane AP35	*1*
APM 50WP/Cyprex 65WP	*1*

# Respondents: 11

2. What water volume do you apply fungicides in? (gal/ac)

10 - 35	**36 - 50**	**51 - 75**	**76 - 100**	**100+**
4	4	2	4	1

# Respondents: 15

3. What pressure do you use when applying fungicides?

25 - 60 psi	**100-150psi**	**175-200 psi**	**300 psi**
12	6	3	1

# Respondents: 22

4.Do you feel you have poor root development?

YES	**NO**	**DON'T KNOW**
4	14	8

# Respondents: 26

5. If you have fumigated in the fall of 1990, how many ha/ac?

# Respondents: 0

6. What fumigant and rate did you use?

# Respondents: 0

SECTION 4 - INSECTICIDES:

TOTAL # RESPONDING TO SECTION 4: 35

Total number spraying insecticides in 1990: 27

Total number **indicating** that they do not spray insecticides, or did not spray them in 1990: 8

A. Strawberry Weevil (Clipper)

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 22

TOTAL # SPRAYING FOR STRAWBERRY WEEVIL: 20

CHEMICAL	# USERS	RATE		# APPLICATIONS		ACRES/APPLICATION			
		REC.[3]	OTHER	1	2	2	3	4	5+
Malathion 25WP	7	6		3	3	1	2	1	2
Methoxychlor Marlate 50WP	2	1	0.5kg/acre	1	1			1	1
Furadan 480F	7	5	1.5L/ha	4			1	1	1
Cymbush 250EC	1	1		1					1
Ripcord 400EC	0								

---

[3] *Recommended rates: Malathion 25WP - 4.5 kg/ha; Methoxychlor/Marlate 50WP - 4.5 kg/ha; Furadan 480F - 2.25 L/ha or 32 oz/ha; Cymbush 250EC - 280 mL/ha or 4.0 oz/ac; Ripcord 400EC - 175 mL/ha or 2.5 oz/ac.*

B. Leaf Tier, Spittlebug, Aphids, Tarnished Plant Bug

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 15

TOTAL # SPRAYING FOR LEAF TIER, SPITTLEBUG, APHIDS, AND/OR TARNISHED PLANT BUG: 11

CHEMICAL	# USERS	RATE		# APPLICATIONS				ACRES/APPLI-CATION				DAYS FROM SPRAY TO HARVEST		
		REC.[4]	OTHER	1	2	3	4	2	3	4	5+	6-10	11-19	20+
Diazinon 50WP	3	2		2					1	1				1
APM 50WP/ Guthion 50WP	1	1		1							1			
Guthion 240EC	0													
Cymbush 250EC	0													
Cygon 480EC/ Sys-tem 480EC	1		light	1				1						
Thiodan 50WP/ Endosulfan 50WP	2	2			1						1			1
Thiodan 400EC/ Endosulfan 400EC	7	6	3L/ac	5		1	1		3	2	2	1	1	1
Cymbush 250EC	0													
Ripcord 400EC	0													

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[4] Recommended rates: Diazinon 50WP - 2.25 kg/ha; APM 50WP/Guthion 50WP - 1.1 kg/ha; Guthion 240EC - 280 mL/ha or 4.2 oz/ac; Cymbush 250EC - 250 mL/ha or 3.5 oz/ac; Cygon 480EC/Sys-tem 480EC - 2.75 L/ha or 40 oz/ac; Thiodan 50WP/Endosulfan 50WP - 2.25 kg/ha; Thiodan 400EC/Endosulfan 400EC - 2.25 L/ha or 0.20 gal/ac; Cymbush 250EC - 250 mL/ha or 3.5 oz/ac; Ripcord 400EC - 250 mL/ha or 3.5 oz/ac.

C. Slugs

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 10

TOTAL # SPRAYING FOR SLUGS: 5

CHEMICAL	# USERS	RATE		# APPLICATIONS	ACRES/APPLICATION				DAYS FROM SPRAY TO HARVEST
		REC.[5]	OTHER	1	2	3	4	5	20+
Lannate L	5	4	1.6L/ac	4	1	1	2	1	4

D. Two-Spotted Spider Mite

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 7

TOTAL # SPRAYING FOR TWO-SPOTTED SPIDER MITES: 2

CHEMICAL	# USERS	RATE	# APPLICATIONS		ACRES/APPLICATION		DAYS FROM SPRAY TO HARVEST
		REC.[6]	1	2	2	10	6-10
Kelthane 35WP	2	2	1	1	1	1	2

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[5] *Recommended rate: Lannate L - 3.25 L/ha or 46 oz/ac*

[6] *Recommended rate: Kelthane 35WP - 2.75 kg/ha*

E. Cyclamen Mite

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 10

TOTAL # SPRAYING FOR CYCLAMEN MITE: 8

CHEMICAL	# USERS	RATE		# APPLICATIONS			ACRES/APPLICATION			
		REC.[7]	OTHER	1	3	4	2	3	4	5+
Thiodan 400EC/ Endosulfan 400EC	8	7	1L/ac	3	1	1	1	1	1	3
Thiodan 50WP/ Endosulfan 50WP	1						1			

F. Insecticide Spraying Method

TOTAL # RESPONDENTS IN THIS SUB-SECTION: 14

TYPE OF NOZZLE				PRESSURE (IN PSI)					
HOLLOW CONE	FULL CONE	FLAT FAN	OTHER[8]	25	40	50	100	125	200
6	0	6	1	1	3	3	3	3	1

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[7] *Recommended rates: Thiodan 400EC/Endosulfan 400EC - 5-10 L/ha or 70-140 oz/ac; Thiodan 50WP/Endosulfan 50WP - 4.5-9.0 kg/ha*

[8] *Teejet TK50*

Additional Comments

1. Strawberry Clipper Weevil:

OTHER CHEMICALS USED, BUT NOT LISTED IN SURVEY:

Malathion 500EC - 3 users, each at a rate of [1L/acre]; each one application with one covering five acres per application, one covering six acres per application, and one covering eight acres per application.

Sevin 50% WP - 1 user, at a concentration of [1.25%] (8 ounces per 4 gallons of water).

2. Leaf Tier, Spittlebug, Aphids, Tarnished Plant Bug:

OTHER CHEMICALS USED, BUT NOT LISTED IN SURVEY:

Furadan - 1 user at a rate of [0.6L/acre]

One producer sprays Thiodan 400EC/Endosulfan 400EC at the recommended rate, but it is applied at renovation instead of before harvest.

3. Cyclamen Mite:

One producer applies Thiodan 50WP on two acres of Micmacs but he did not indicate the rate used.

General:

One producer noted that for all pesticides, a 72-hour waiting period before harvest is observed. He tries not to spray during harvest, and only does so as a last resort.

SERIES I FRUIT TESTING NETWORK EVALUATION

S.L. Stuible

ABSTRACT: Growth relationships among the various rootstocks and scions are less discernable than those reported two years previously. Early yield figures, however, confirm the inverse relationship between vigour and yield. Generally, the yield efficiency of Summerland McIntosh was higher than Lobo, and, surprisingly, Dewar McIntosh, the only spur-type cultivar, was the least efficient. However, in absolute terms (yield per tree) Dewar McIntosh was intermediate between Lobo and Summerland McIntosh. Rootstock effects on yield were not yet apparent.

ÉVALUATION DE LA PREMIÈRE SÉRIE DU RÉSEAU D'ESSAI D'ARBRES FRUITIERS

S. L. Stuible

RÉSUMÉ : Les rapports de croissance entre les divers porte-greffe et greffons sont moins marqués que ceux signalés il y a deux ans. Toutefois, les premiers résultats sur le rendement confirment le rapport inverse entre la vigueur et le rendement. En général, les possibilités de rendement des pommiers Summerland McIntosh sont plus élevées que celles des pommiers Lobo et, à notre grande surprise, le seul pommier de type compact,Dewar McIntosh, s'est avéré le moins efficace. Cependant, en termes absolus (rendement par arbre) le pommier Dewar McIntosh s'est classé entre les pommiers Lobo et le Summerland McIntosh. On n'a pas encore constaté d'effets sur le rendement produits par les porte-greffe.

INTRODUCTION: Since the heavy winter losses of the early 1980s, there has been demand for research into rootstocks to withstand New Brunswick winters. The Fruit Testing Network was established by the NB Fruit Growers Association to test various rootstocks (and scion combinations) on-farm. Initial data on tree survival, growth and yield have been collected on the Series I plantings. Preliminary results on growth and tree survival have been reported in this journal in the past (1989). The following is an update of these results.

MATERIALS AND METHODS: Series I trees were planted in 1987 (on five sites) and in 1988 (on four of the five sites). The rootstock/scion combinations are shown in Table 1, below, by planting year and tree numbers (initial and surviving).

One point to note relative to tree survival - some of the least successful rootstock/scions suffered less from cold than from deer damage (Site 5). In addition, several trees have been "lost" after they were interplanted in an existing orchard where other replacement planting has occurred and tags have disappeared (Site 2).

TABLE 1: Rootstock/scion Combinations and Tree Survival in Series I

SCION/ INTERSTEM	ROOTSTOCK							
	MM111		ALNARP 2		BEAUTIFUL ARCADE		MILWAUKEE	
	YEAR	NO.	YEAR	NO.	YEAR	NO.	YEAR	NO.
DEWAR McINTOSH (survived)	1987	41 (39)	1987	30 (29)	1987	30 (29)		
SUMMERLAND McINTOSH (survived)					1987	26 (23)		
LOBO (survived)	1987	30 (30)	1987	24 (24)	1987	47 (45)		
SUMMERLAND /OTTAWA 3 (survived)	1987	32 (32)	1997	40 (34)	1988	28 (25)	1988	18 (11)
LOBO /OTTAWA 3 (survived)	1988	20 (13)	1988	24 (22)	1988	24 (19)	1988	33 (15)

The five sites are as follows: D.Coburn in Keswick Ridge (1); Ferme Belliveau in Pres d'en haut (2); J.Lamoreau in Centerville (3); La Fleur du Pommier in Cocagne (4); and Uris Williams and Sons in St. Antoine (5). A randomized block design was attempted, but was made impossible by problems with tree availability and site size. Thus, the data will not meet the conditions required for statistical analysis. Instead, simple averages will be used to discuss the results.

The planting was split over two years (again due to tree availability) and hence the discussion will reflect this difference in age. Once differences in trends (growth and yield) are no longer noticed between the two planting years, this data will be combined to streamline the discussion. Since both plantings are beginning to bear, this should be possible within 2 or 3 years.

Data was collected annually on two parameters - trunk circumference (at 50 cm) and terminal growth. In addition, yield data was collected this year from 3 of the 5 sites. In future, terminal growth data will become too difficult to collect (as the trees get taller), so yield and trunk circumference will be the only variables.

RESULTS AND DISCUSSION: Discussion will be organised into three main categories - comparisons amongst cultivars, rootstocks, and sites. Within each category, the results will be presented in the form of three graphs depicting trunk circumference, terminal growth and yield.

These graphs are somewhat complicated - the 1987 planting is paired with the 1988 planting around a central vertical axis. The bars pointing to the left of this central axis refer to data collected on the 1987 trees (with different shading for each year collected) while the bars pointing right refer to 1988 trees.

Graphs depicting trunk circumferences show the total trunk size in centimetres, divided into sections according to the growth that occurred each year. For trees planted in 1987, the initial size (1987) and the growth in 1988 are combined in the first (double-hatched) stacked bar, since initial size was not recorded for all sites. However, 1988 trees depict the initial size and the growth for each subsequent year separately.

Terminal growth is shown on the graphs as cumulative, similar to the trunk circumference graphs. However, referring to this as the leader size is somewhat misleading, as the leaders may or may not have been headed back somewhat after the growth measurement was taken.

Yield is shown in two ways on each graph - as yield (in kilograms) per tree and as yield per trunk cross-section area (TCA) in grams per squared centimetre. The latter measure is a fairly standard method of depicting yield that reflects the efficiency of the tree at diverting energy from growth into fruiting. Thus, a small tree could produce less than a larger tree in absolute terms yet still produce more over a given planted area in relative terms.

Cultivar Comparisons: Direct comparisons among the cultivars is made difficult by the way the planting was split over two years. In 1987, two varieties were planted without interstems (Dewar McIntosh (DMAC) and Lobo) and one with interstems (Summerland McIntosh on Ottawa 3 (SUMM/O3)), while in 1988 both varieties planted were on O3. Thus, comparisons will require deductive reasoning using each year's data in sequence. Once the tree age supports ignoring the difference in planting year, this type of extrapolation will not be necessary.

With the 1987 trees, trunk and terminal growth (Figures 1 and 2) were similar for DMAC and LOBO, both of which grew faster than SUMM/O3 (as was expected with an O3 interstem). However, in 1988 trees where both LOBO and

SUMM were on O3, SUMM has increased in trunk circumference slightly faster than LOBO, while terminal growth was nearly identical. Thus, the data is still inconclusive as to which cultivar produces the most growth (and potentially the largest tree).

FIGURE 1: Comparison of Trunk Circumference by Various Cultivars.

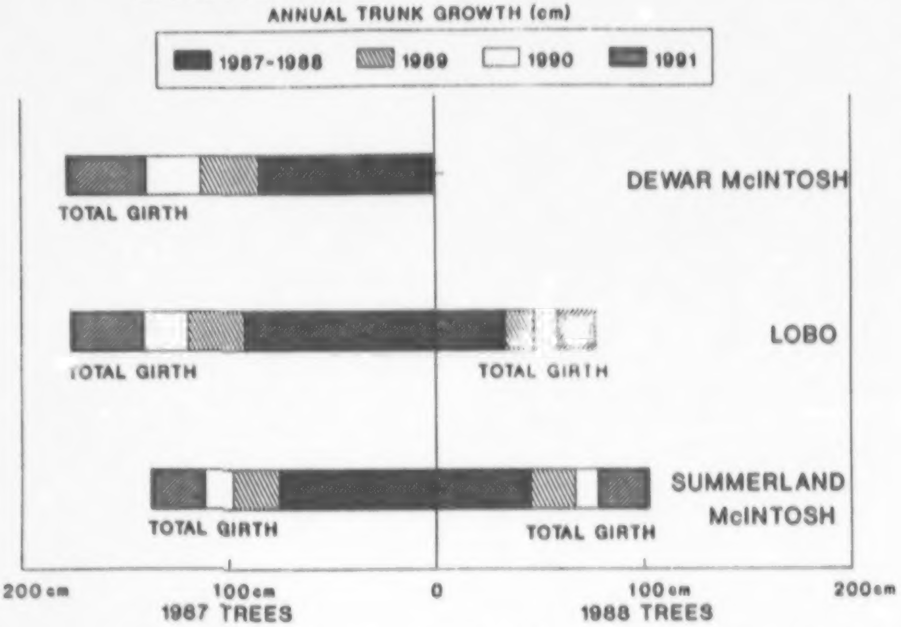
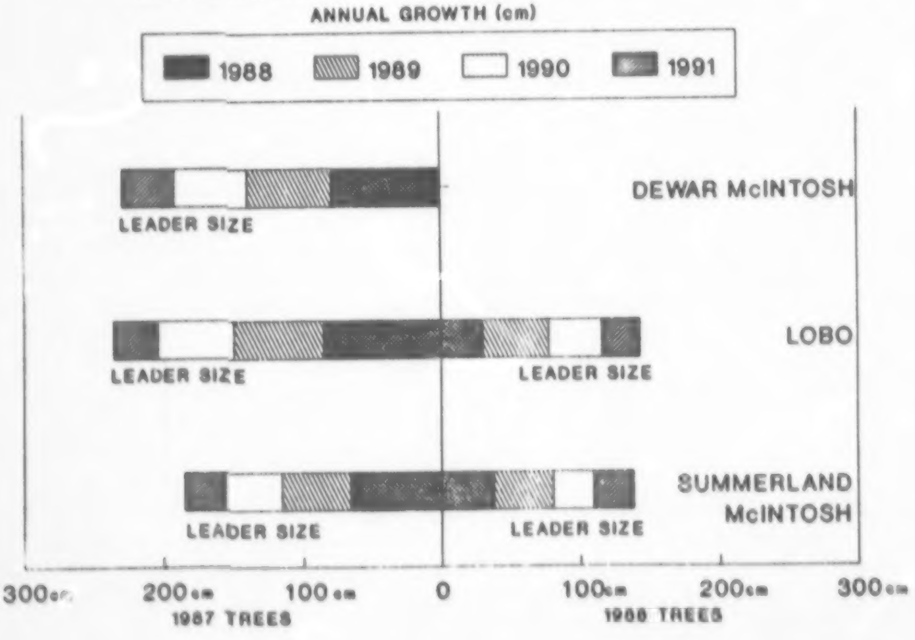
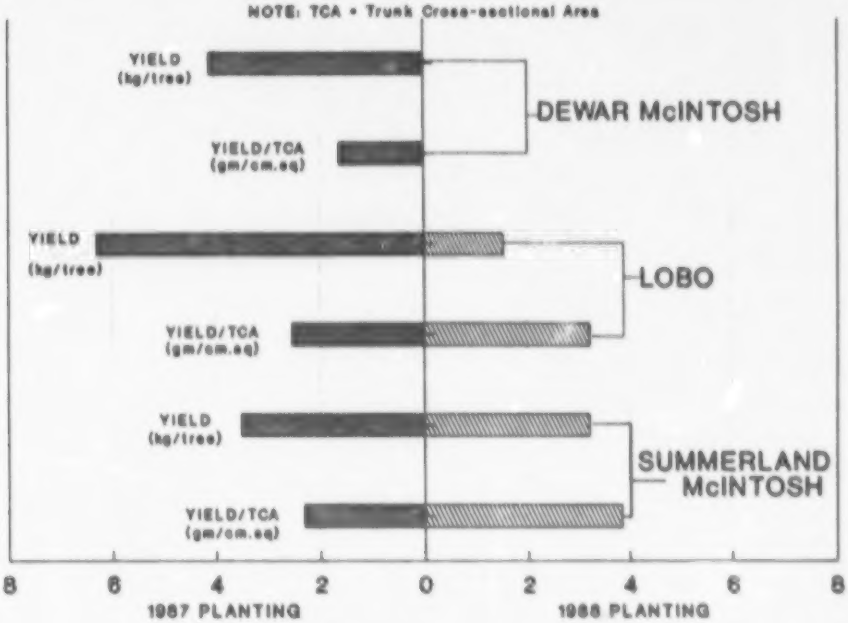


FIGURE 2: Comparison of Terminal Growth by Various Cultivars.



Yield comparisons among cultivars are shown in Figure 3. For the 1987 trees, LOBO produced more fruit per tree than DMAC and SUMM/O3, respectively, but the yield efficiency (per TCA) was similar for LOBO and SUMM/O3 (both of which outperformed DMAC in relative terms). For the 1988 trees, SUMM outyielded LOBO in absolute yield and in yield efficiency.

FIGURE 3: Comparison of Yield by Various Cultivars.



In summary, while there is little evidence yet to differentiate cultivars by tree vigour, there do seem to be significant yield differences. SUMM appears to yield more (or earlier) than LOBO in both absolute yield and yield efficiency, while both are more yield efficient than DMAC, at least in the first year of recorded yields.

Rootstock Comparisons: Trunk circumference and terminal growth (Figures 4 and 5) moved together for the 1987 planting but diverged in the 1988 planting. In 1987, Beautiful Arcade (BA) grew faster than Alnarp 2 (A2) and Malling Merton 111 (MM111). The same trend repeated itself in 1988 trees when considering trunk girth, although the differences between rootstocks were smaller. Milwaukee (MLWKE) rootstocks were also planted in 1988, and these grew in circumference at a similar rate as MM111. However, BA and A2 traded places in the ranking when comparing terminal growth of the 1988 trees, and MLWKE outgrew all the rootstocks.

FIGURE 4: Comparison of Trunk Circumferences by Various Rootstocks.

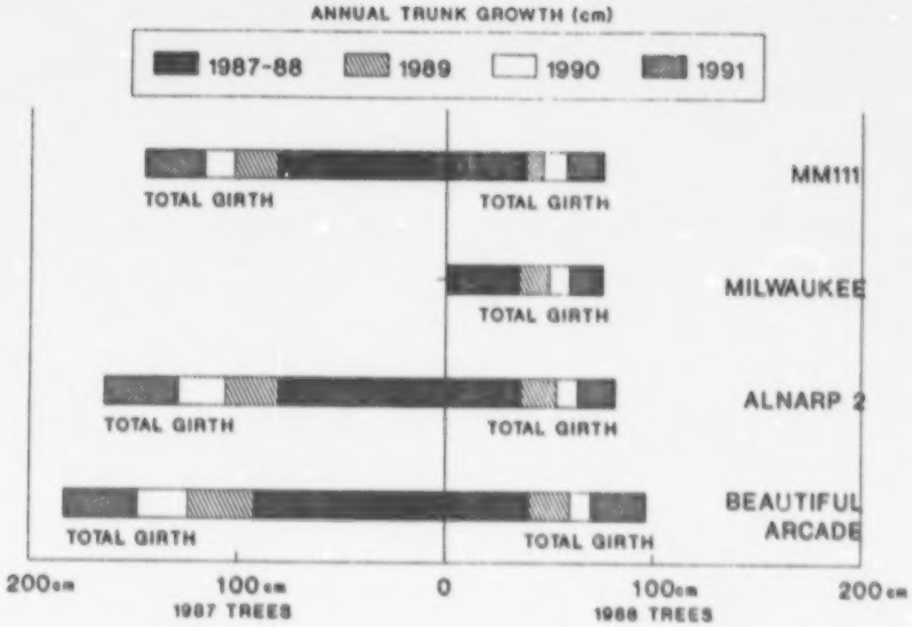
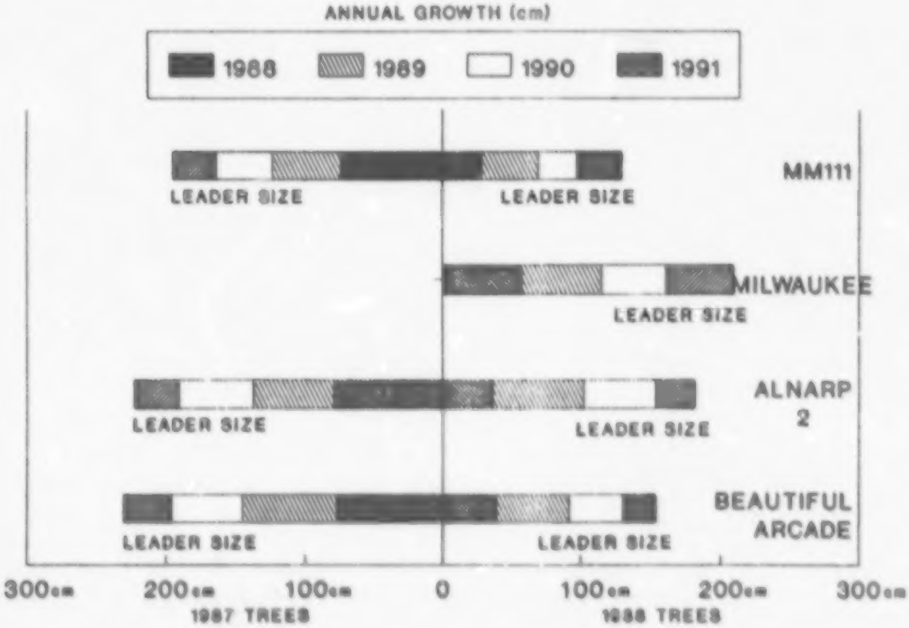
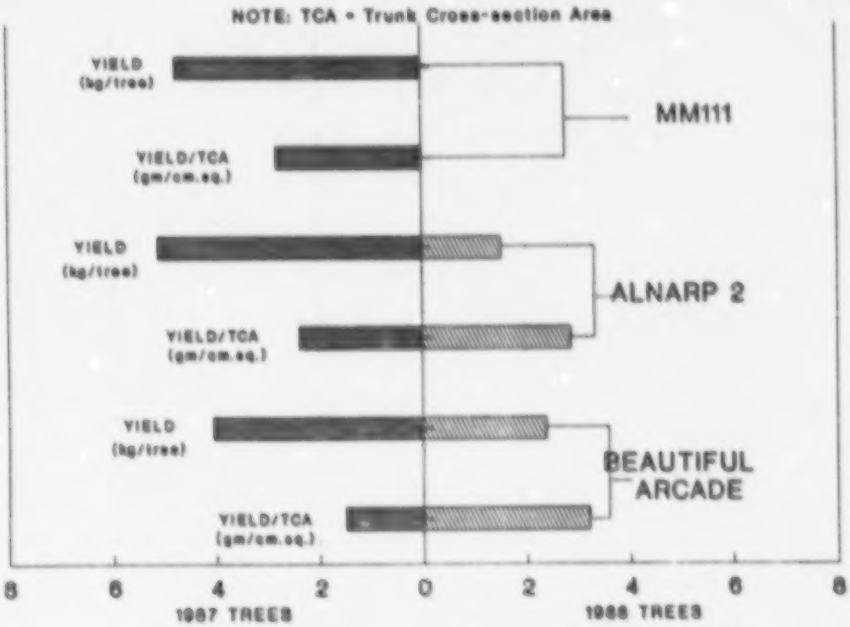


FIGURE 5: Comparison of Terminal Growth by Various Rootstocks.



In terms of yield (Figure 6), the absolute yield of A2 was higher than MM111 and BA, for 1987 trees, but BA outproduced A2 in the 1988 trees. Despite this reversal, both planting years revealed an inverse relationship between terminal growth and yield per tree, as one would expect. This inverse relationship between terminal growth and yield also held for yield efficiency, where MM111>A2>BA in the 1987 trees, and BA>A2 in the 1988 trees.

FIGURE 6: Comparison of Yield by Various Rootstocks.



Therefore, while it is still too early to conclude which rootstock will produce the most growth or will yield most efficiently, achieving the expected relationship between yield and growth implies that a more definite pattern will emerge as the trees mature.

Site Comparisons: Growth rankings among sites vary each year, and even vary between planting years on the same site. However, when looking at totals of either trunk circumference or terminal growth (Figures 7 and 8), Site 5 leads among the 1987 plantings while Site 4 leads among the 1988 plantings.

FIGURE 7: Comparison of Trunk Circumference by Various Sites.

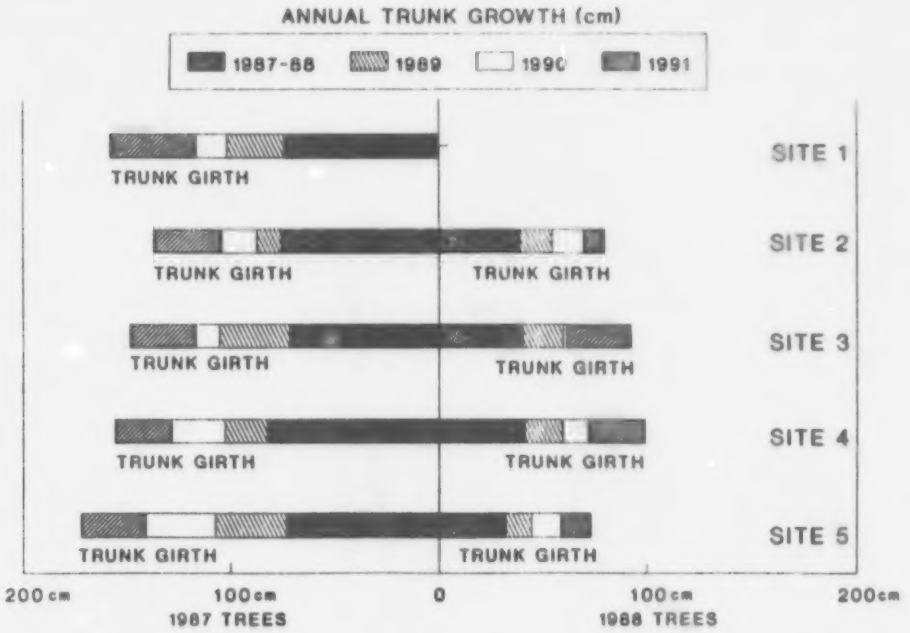
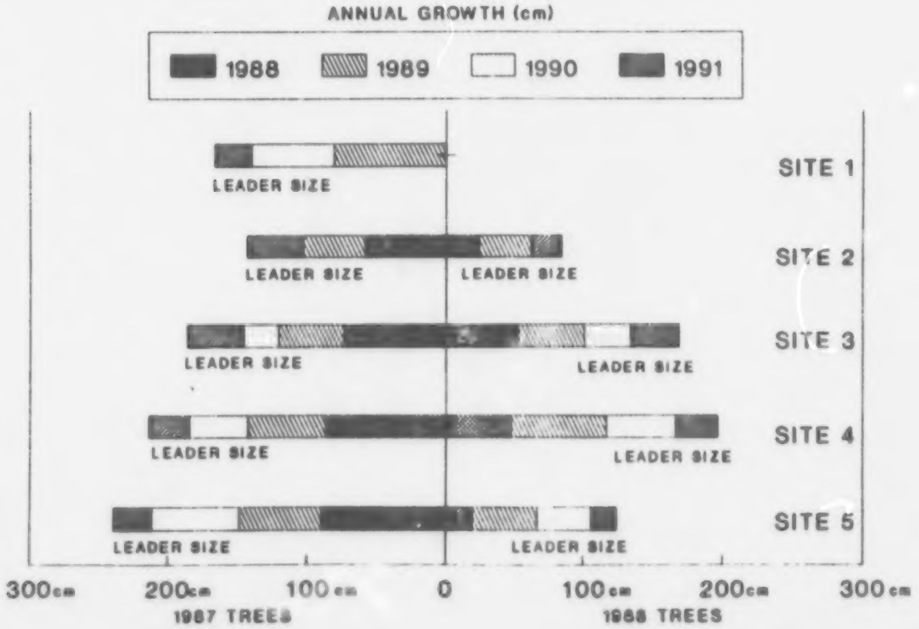
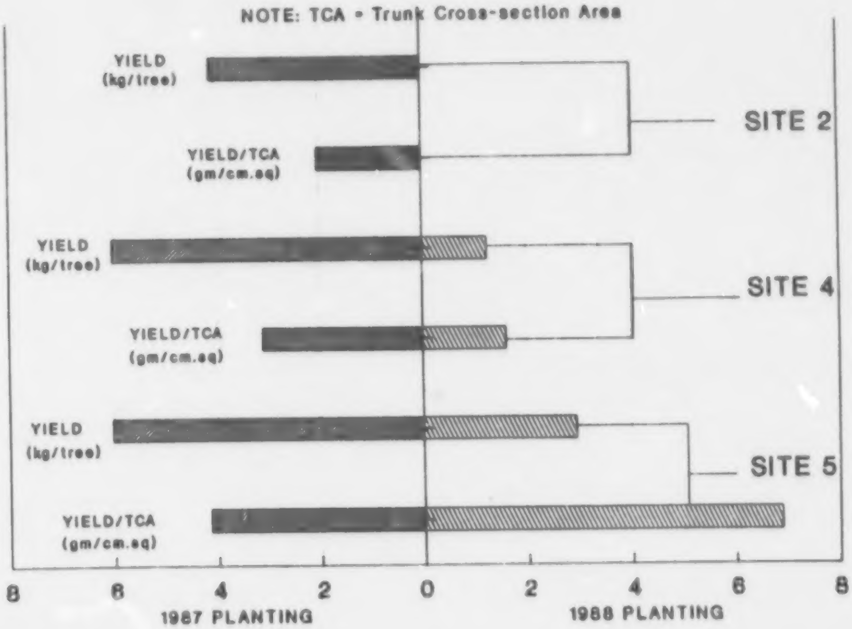


FIGURE 8: Comparison of Terminal Growth by Various Sites.



When considering absolute yield (Figure 9), Sites 4 and 5 were nearly equal (and greater than Site 2) among the 1987 trees, while Site 5 out yielded Site 4 in the 1988 trees. Yield efficiency was higher on Site 5 than 4 for both planting years. Therefore, Site 5 had somewhat higher (or earlier) yield than Site 4 and Site 2, respectively.

FIGURE 9: Comparison of Yield by Various Sites.



Thus, growth was directly related to yield in the 1987 planting and indirectly related in the 1988 planting. However, this relationship is less meaningful when comparing sites, since it is confounded by differences in cultivars and rootstocks planted at each site.

CONCLUSIONS: Since vigour did not vary much, the only notable difference among cultivars was the higher (or earlier) yield of SUMM. The relatively low yield of DMAC is surprising given it is the only spur-type cultivar included in the trial.

The rootstock comparisons, while confirming the vigour/yield trade-off, make inferences difficult given the very divergent results from the two different planting years. In 1987 trees, BA trees have grown the most and have yielded the least relative to MM111 and A2. In 1988 trees there is less of a pattern in terms of vigour, but yield was higher in BA than in A2.

Comparisons among sites are less useful. In both yield and vigour the highest ranking sites (4 and 5) are not dissimilar. These are the two sites with the most in common in terms of management, location, soil types and climate. Hence, there is no surprise that these sites are so similar. Sites 1 and 3 should really not be considered for comparison, since the data from these sites is much less reliable (trees were often interplanted and there is doubt as to the validity of the site maps and tags).

Finally, comparisons could be made between different rootstock/scion combinations. These are summarized for later reference in Table 2 below, however any discussion of these results is considered premature until the two planting years can be pooled. As mentioned above, this should be possible when the trees approach maturity.

Table 2: Average Circumference, Terminal Growth and Yield per TCA for Various Rootstock/scion Combinations.

SCION/ INTERSTEM	ROOTSTOCK											
	MM111			ALNARP 2			BEAUTIFUL ARCADE			MILWAUKEE		
	C	TG	Y/ TCA	C	TG	Y/ TCA	C	TG	Y/ TCA	C	TG	Y/ TCA
DEWAR McINTOSH	149	49	2.5	172	54	1.2	179	55	1.3			
SUMMERLAND McINTOSH							166	48	–			
LOBO	157	49	2.8	168	60	2.9	173	52	1.9	104	47	–
SUMMERLAND /OTTAWA 3	103	36	–	127	41	3.2	115	37	2.7	79	31	–
LOBO /OTTAWA 3	77	32	–	81	45	2.8	77	38	3.1	66	26	–

C = Circumference (cm)
TG = Terminal Growth (cm)
Y/TCA = Yield per Trunk Cross-section Area (g/cm^2)

APPLE QUALITY AFTER TRANSPORT

S.L. Stuible

ABSTRACT: Out of 50 bags of McIntosh apples inspected at the packinghouse, 22 were recovered upon arrival at the back of the store. At the packinghouse, 3 of the 50 bags did not meet grade due to either skin punctures or bruises. At the store, another 6 bags would have been removed due to skin punctures, and an additional 7 bags would have been removed due to bruising. In all, 13 of the 22 bags would have been detained due to damage incurred after the packinghouse.

QUALITÉ DES POMMES APRÈS LE TRANSPORT

S.L. Stuible

RÉSUMÉ : Cinquante sacs de pommes McIntosh ont été inspectés à l'usine d'emballage. On a récupéré 22 de ces sacs à l'arrivée à l'arrière du magasin. Au départ de l'usine, 3 des 50 sacs ne satisfaisaient pas aux conditions de qualité en raison de meurtrissures ou de perforations de la pelure. À l'arrivée, il a fallu retirer d'autres sacs du marché : 6 à cause de perforations de la pelure et 7 à cause des meurtrissures. Au total, 13 sacs sur 22 ne satisfaisaient plus aux exigences en raison des dommages subis durant le transport.

INTRODUCTION: Official inspection of N.B. apples occurs at the retail shelf. This makes it very difficult to determine at what stage any damage occurs - during packing, transport to wholesale, load assembly, transport to stores, handling by retail staff or handling by consumers. This study was designed to follow fruit of a known quality through the system, testing it at various stages to monitor changes in quality. It was hoped we would be able to test whether the increased handling or distance travelled on the roads adversely affected apple quality. While only preliminary, if problems were detected this test could be repeated on a larger scale.

MATERIALS AND METHODS: One packing operation was used in order to simplify the procedure. Hill Crest Ltd. was chosen because of the variety of destinations for their fruit - both to a wholesaler as well as direct to retail.

On April 22, 1991, fifty bags of McIntosh apples were inspected by N.B.D.A. inspectors immediately after they were packed. The bags were numbered and each defect was noted. The numbered bags were replaced in the boxes - one in a corner position and one in the middle of the box. Twenty-five boxes were tagged and then were distributed throughout the orders assembled (on pallets) to ensure they were sent to a variety of wholesale and retail destinations.

In addition, apples were sampled from the grading line (from the same lots packed and inspected) in order to determine average pressure test - results ranged between 11 and 12 pounds (a fairly crisp McIntosh for late winter/early spring).

Recovery of the bags inspected after reaching their destination proved very problematic. While the loads destined direct to the retail outlets were recovered, problems with the wholesalers trucking (it failed to pick up the load the first day and broke down on the road the next) meant that the tagged boxes could not be inspected at the warehouse. Instead, the retail outlets serviced by the wholesaler were checked on a daily basis for marked bags. These were eventually found, but only after the fruit underwent an unusually arduous journey.

On April 23, 14 bags of apples (out of 16 anticipated) were reinspected at two Saint John stores which received their fruit direct from the packinghouse. These apples were inspected as soon as they arrived at the back of the store. On April 24, four bags (out of 6) were inspected at another store. These apples had arrived late the previous day, but were still in the cold room. It was not until April 26 that a marked box (2 bags) was found in the cold room of a store in Moncton. This was kept under refrigeration over the weekend, and another box was found at the same store in Moncton as it arrived off the truck on Monday, April 29. These were then carefully transported to Fredericton for reinspection.

RESULTS AND DISCUSSION: In all, 22 of the 50 inspected bags of apples were recovered. These were mostly apples that went direct to the retail outlets. As mentioned above, the apples that went through the wholesale route underwent a series of unusual events - they were not picked up for over a day, the truck broke down (on quite a warm, sunny day) for several hours, and in the ensuing confusion the boxes couldn't be traced through the system. When a few of these boxes were found, it was after a considerably longer time than the others, which makes the inspection results much less comparable. However, the results do show just how tender apples are.

According to N.B.D.A. grade standards, a bag of apples will be removed from the shelf if damage occurs on more than 10% of the fruit. Only damage that could occur due to rough handling, and not cosmetic problems (such as russetting, stings, undersize or insufficient colour) was counted. Table 1 shows the two types of damage that commonly occur after packing - bruising and skin punctures.

Table 1: Skin Puncture Damage After Transport

STORE LOCATION	STORE ID D=DIRECT W=WHSLE	DAYS TO FINAL INSP'N	SKIN PUNCTURES (ABSOLUTE)		APPLE #	SKIN PUNCTURES (% OF APPLES)	
			INITIAL	FINAL		INITIAL	FINAL
Saint John	D1	1	0	0	12	0	0
Saint John	D1	1	0	0	16	0	0
Saint John	D1	1	1	1	14	7.1	7.1
Saint John	D1	1	0	0	12	0	0
Saint John	D1	1	1	2	13	7.7	15.4
Saint John	D1	1	2	3	13	15.4	23.1
Saint John	D1	1	0	0	14	0	0
Saint John	D1	1	1	2	11	9.1	18.2
Saint John	D2	1	0	0	20	0	0
Saint John	D2	1	1	1	18	5.5	5.5
Saint John	D2	1	0	0	21	0	0
Saint John	D2	1	1	3	20	5.0	15.0
Saint John	D2	1	1	1	20	5.0	5.0
Saint John	D2	1	1	2	20	5.0	10.0
Saint John	D3	2	0	1	18	0	5.5
Saint John	D3	2	0	1	22	0	4.5
Saint John	D3	2	1	3	19	5.3	15.8
Saint John	D3	2	1	2	20	5.0	10.0
Moncton	W4	7	0	0	12	0	0
Moncton	W4	7	0	1	13	0	7.7
Moncton	W4	7	0	0	13	0	0
Moncton	W4	7	0	0	13	0	0
AVERAGE			.5	1.0	16	3.1	6.5

As shown in Table 1, above, skin punctures, on average, increased from 0.5 per bag to 1 per bag. When expressed in terms of the numbers of apples affected (as in inspection reports), the skin punctures increased from 3.1% to 6.5% averaged over all 22 samples recovered. Amongst the samples, the initial damage ranged from 0% to 15.4%, while the final damage ranged from 0% up to 23%.

Stated another way, of the 22 bags recovered, there was one additional apple with a skin puncture in eight bags and two more punctures in two bags. Altogether, six out of 22 (27%) bags which met grade upon leaving the packinghouse would have been removed from the store if inspected upon arrival by NBDA Inspection Branch.

Table 2: Bruising Damage After Transport

STORE LOCATION	STORE ID D=DIRECT W=WHSLE	DAYS TO FINAL INSP'N	BRUISED APPLES (ABSOLUTE)		APPLE #	BRUISED APPLES (% OF BAG)	
			INITIAL	FINAL		INITIAL	FINAL
Saint John	D1	1	0	0	12	0	0
Saint John	D1	1	0	0	16	0	0
Saint John	D1	1	0	0	14	0	0
Saint John	D1	1	0	0	12	0	0
Saint John	D1	1	0	1	13	0	7.1
Saint John	D1	1	0	0	13	0	0
Saint John	D1	1	0	0	14	0	0
Saint John	D1	1	0	0	11	0	0
Saint John	D2	1	0	0	20	0	0
Saint John	D2	1	0	3	18	0	16.7
Saint John	D2	1	3	9	21	14.3	42.9
Saint John	D2	1	0	1	20	0	5.0
Saint John	D2	1	2	2	20	10.0	10.0
Saint John	D2	1	0	0	20	0	0
Saint John	D3	2	0	6	18	0	33.3
Saint John	D3	2	0	3	22	0	13.6
Saint John	D3	2	0	4	19	0	21.0
Saint John	D3	2	0	3	20	0	15.0
Moncton	W4	7	0	3	12	0	25.0
Moncton	W4	7	0	3	13	0	23.1
Moncton	W4	7	0	6	13	0	46.1
Moncton	W4	7	0	5	13	0	38.5
AVERAGE			0.23	2.23	16	1.4	13.8

As shown in Table 2, the number of apples with bruising beyond the grade limit increased from 0.2 per bag to over 2 per bag, on average. When expressed in percentages, bruising increased from 1.4% to 13.8% of all the apples sampled. Thus, the average bag went from meeting grade to exceeding allowable defects.

Amongst the samples, only 2 of the 22 bags had bruises initially (both would have failed inspection), but after transport this increased to 11 of the 22 bags would have failed inspection - damage ranged from 10% to 46% of the apples in those bags.

There was no discernible difference in damage due to skin punctures between direct to retail versus wholesale to retail delivery. In the case of bruise damage, there was a high degree of correlation between stores, although the longer time to testing (seven days versus one or two days) could well explain the increased susceptibility to bruising as exhibited by the apples that went through the wholesale system.

CONCLUSIONS: The grading standards decree that no more than 10% of the apples in a bag can have defects (beyond tolerance levels). Therefore, damage from bruising and skin punctures (and any other defects) can not add up to 10 percent or more. After initial inspection, 3 of the 22 bags would have been detained. After inspection at the back of the store, 13 more bags would have been detained. In percentages, nearly 14% of the bags did not meet grade at the packinghouse, and another 59% were damaged beyond allowable limits between the packinghouse and the back of the store. Even disregarding the apples from the Moncton store, 50% of the remaining bags were damaged in transit. This is clearly unacceptable.

The damage reported here does not include damage that can occur at the retail level, either in stacking the display or handling by consumers. The size of the trial and logistics of following the fruit through a rather complicated system made it impossible to draw conclusions about direct retail versus wholesale systems, nor could it distinguish between loading and unloading damage and damage which occurs over our roads.

A more complete study is planned for the fall of 1992 and spring of 1993, under the Apple Quality Improvement Program. This is necessary if all the above variables are to be considered. Since the results from this short test are so startling, verification is crucial.

VEGETABLES/LÉGUMES

THE EVALUATION OF SEAWEED (*Ascophyllum nodosum*) EXTRACT ON CROP PRODUCTION

Karel T. V. Michalica

ABSTRACT: N.B. Agriculture designed these trials to evaluate the effects of locally-produced seaweed extract (*Ascophyllum nodosum*) at various rates of application under New Brunswick growing conditions. We found that the germination rates of three varieties of seeds (broccoli, cucumber, and tomato) improved with the application of seaweed extract as a quick-soak treatment. Similarly, the yield of greenhouse tomato and field-grown broccoli crops increased with the application of seaweed extract as a crop nutrient. Although we also tested the effect of seaweed extract on potato crop yields, the results were inconclusive due to wide variations in field data caused by weather and field conditions beyond our control.

ÉVALUATION D'UN EXTRAIT D'ALGUES (*Ascophyllum nodosum*) SUR LE RENDEMENT DES CULTURES

Karel T.V. Michalica

RÉSUMÉ : Le ministère de l'Agriculture du Nouveau-Brunswick a organisé des essais afin d'évaluer l'efficacité d'un extrait d'algues (*Ascophyllum nodosum*) produit localement selon diverses doses dans les conditions de culture au Nouveau-Brunswick. Nous avons constaté que la germination de trois variétés de graines (brocoli, concombre et tomate) s'est améliorée avec l'extrait d'algues à titre de solution de trempage rapide. Le rendement des tomates en serre et du brocoli en plein champ s'est également amélioré lorsqu'on a utilisé l'extrait d'algues comme engrais pour les cultures. Nous avons aussi essayé l'extrait d'algues sur des pommes de terre, mais les résultats n'ont pas été concluants en raison d'importants écarts dans les données relatives à la température et à l'état des champs, des circonstances indépendantes de notre volonté.

INTRODUCTION: In many countries, producers have harvested, washed and dried seaweed and used it as fertilizer for centuries. When incorporated into the topsoil as a comprehensive soil conditioner, dried seaweed improves the soil's physical characteristics, increases its organic matter content, and enriches its nutritional value. An extensive body of literature (mainly European works) describes the benefits of seaweed to a wide variety of crops: seaweed satisfies the plant's nutritional requirements (particularly the need for micro-nutrients) and provides such natural growth-promoting substances as enzymes. The positive effects of seaweed fertilizer are well documented: enhanced seed germination; improved yield, quality and vigour of crops; increased crop stand uniformity; prolonged shelf-life; and reduced incidence of damage from pests and fungal diseases. In spite of these benefits, the sheer difficulty of handling the bulky amendment has limited its use to coastal areas.

Thanks to new technology, manufacturers have discovered a way to eliminate the bulk of seaweed while retaining its value as a crop nutrient. Concentrated seaweed extract is now produced by applying heat, pressure, and a small amounts of inorganic compounds to naturally-harvested seaweed. By producing a concentrated seaweed extract for on-site dilution and foliar application, manufacturers are now able to market the product over great distances. For example, horticultural producers in the Atlantic region may purchase Norwegian seaweed extract.

Recognizing the demand for easily-handled crop nutrients and the availability of excellent quality seaweed (Acsophyllum nodosum), local entrepreneurs have begun marketing locally-produced liquid and powdered extract. The potential benefits of locally-produced seaweed extract for New Brunswick's agri-food industry are readily apparent: the product is well suited for sustainable organic production systems (rather than presenting an environmental threat, seaweed extract could only increase the soil's biological activity); the product could enrich large areas of land that have been depleted by prolonged row-crop monoculture; and the supply of raw seaweed is sufficient to accommodate a great demand for economically and ecologically sound crop nutrients.

ORIGIN AND AIM OF THE INVESTIGATIONS: This investigation was initiated on request of Mr. Hal Corner, a local entrepreneur interested in the development of commercial seaweed extract production in New Brunswick. The study is intended to evaluate the effects of locally manufactured seaweed extract on selected horticultural crops under New Brunswick growing conditions.

METHODS: Concentrated seaweed extract was provided by the Research and Productivity Council of New Brunswick. To ensure freshness, the product was stored in a cool and dark area and diluted no more than 24 hours before application.

It should be noted that the consistency of the seaweed extract may have affected the results of this study. It was a not uniform, clear liquid, but contained solid particles which interfered,at times, with spray application.

Rates and methods of application recommended by W.L. Stephanson ("Seaweed in Agriculture and Horticulture, W.L. Stephenson, 1968, ISBN 085409 8488) provided the basis for this investigation. The investigation comprises four tests; a tomato test; a broccoli test; and a potato test. For each test, two rates of seaweed extract application were compared with a control treatment of distilled water. The first treatment of seaweed extract was applied at Stephenson's recommended rate, and the second treatment doubled Stephanson's recommendations. In both cases, the seaweed extract was diluted with distilled water.

1. The germination test was carried out at room temperature in petri dishes. Tests for each variety of seeds (broccoli, cucumber, and tomato) were replicated four times.

Sites for the tomato test were selected at Curries (soil mixture) and Peads Greenhouses (peat mixture). Clusters of twenty plants were randomly selected in each greenhouse as plots, and four replicates were used to collect data. The plants were sprayed once - during June - with three litres of seaweed extract solution per plot at solution ratios of 1:100 (recommended rate) and 1:50 (double rate). After spraying, the soil of each plot was watered once a week with four litres of seaweed extract at 1:400 (recommended rate) and 1:200 (double recommended rate) until the end of August.

3. Sites for the broccoli test were selected at Reginald Slocum (Young's Cove, Mt. Hope soil series) and Greg Banks (McCowan's Corner, Interval soil series). Ten meter rows were randomly selected in the commercial fields, replicated four times. Another site was established at N.B. Agricultures Horticultural Centre, where each plot was three meters by five meters. Each treatment site was sprayed four times during the season at three week intervals with seaweed extract solutions of 1:1 (recommended rate) and 1:2 (double recommended rate).

4. Sites for the potato test were established at Conrad Toner (Grand Falls, Holmsville soil series, Superior variety) and Dwayne White (Debec, Caribou soil series, Russet Burbank variety). Six-meter rows were randomly selected and replicated three times within the commercial field. Each plot was sprayed twice during the growing season (once prior to last hilling, and once after the canopy had closed) with seaweed extract solutions of 1:20 (recommended rate) and 1:4 (double recommended rate). N.B. Agriculture staff collected and analyzed the yield data after manual harvest.

RESULTS AND DISCUSSION: 1. The positive effect of the quick soak method on the germination of seeds is presented in Table 1. The early germination of broccoli seeds (one day after the soaking was increased by 8.3 - 47.5%. The early germination of cucumber (one day after soaking) was increased by 8.3% The total germination of the same species of seeds was increased by 5.0 -7.4% respectively. The early germination of tomato seeds (four days after soaking) was increased by 13.3% However, the germination of tomato seeds 5 days after soaking was found to have decreased. These results were not statistically analyzed.

2. The positive effect of seaweed extract on the yield of broccoli was recorded on two of the three established sites. The data are presented in Table 2. Both the average head size and weight have increased even though not all the results were statistically significant at 0.05 level. Nevertheless the average weight of broccoli

TABLE 1

The Effect of Quick-Soak Seaweed Treatment on Germination (%)

Variety	Replicate	Variety (water)		Treated	
		1 day	2 days	1 day	2 days
Broccoli (Green Valiant)	1	30.0	90.0	80.0	90.0
	2	50.0	80.0	60.0	100.0
	3	40.0	90.0	90.0	90.0
	4	60.0	100.0	100.0	100.0
	Average	45.0	90.0	92.5	95.0
	Deviation From Ave. (%)	---	---	+47.5	+ 5.0
Cucumber (Market More)	1	100.0	100.0	73.3	93.3
	2	60.0	100.0	66.7	100.0
	3	46.7	66.7	100.0	100.0
	4	93.3	100.0	93.3	100.0
	Average	75.0	91.7	83.3	98.3
	Deviation From Ave. (%)	---	---	+ 8.3	+ 7.4

Variety	Replicate	3 days	4 days	5 days	3 days	4 days	5 days
Tomato (Early Girl)	1	6.7	6.7	66.7	33.3	40.0	73.3
	2	40.0	46.7	86.7	26.7	33.3	53.3
	3	60.0	60.0	86.7	40.0	66.7	93.3
	4	26.7	26.7	100.0	33.3	53.3	73.3
	Average	33.4	35.0	85.0	33.3	48.3	73.3
	Deviation From Ave. (%)	----	----	----	- 0.1	+13.3	-11.7

TABLE 2

The Effect of Foliar Application of Seaweed Extract on Yield of Broccoli

Site	Treatment*	Yield Indicator Ave. Head Size (cm)	Deviation From Average (%)	Significance at 0.05 Level
NB Hort Centre Hoyt (loamy sand)	1	10.85	----	BC
	1	10.00	----	C
	2	15.05	+50.5	A
	3	13.95	+39.5	AB
		Ave. Wt. of Head (g)		
	1	330.7	----	BC
	1	260.4	----	C
	2	510.8	+96.16	A
	3	421.0	+61.61	AB
		Ave. Head Size (cm)		
Banks McGowans Corner (silt loam)	1	16.75	----	A
	2	15.50	- 8.07	A
	3	15.00	- 11.17	A
		Ave. Wt. of Head (g)		
	1	691.25	----	A
	2	686.50	- 0.69	A
	3	608.50	- 13.60	B
		Ave. Head Size (cm)		
Slocums Youngs Cove (loam)	1	13.00	----	A
	2	15.00	+ 15.39	A
	3	13.50	+ 3.85	A
		Ave. Wt. of Head (g)		
	1	286.8	----	B
	2	543.5	+ 89.54	A
	3	353.0	+ 23.10	AB

* 1 Control (Water)
2 Recommended Rate
3 2 x Recommended Rate

heads has increased from 23 to 89% in comparison to the control. It is felt that the negative results at Banks were effected by an accidental interference during the early commercial harvest.

3. Both the yield and number of fruits of the greenhouse tomatoes have increased in Curries greenhouses even though the results were not significant at 0.05 level (Table 3). Nevertheless the yield was increased up to 20% and the number of fruits by 35% in comparison to the control. The results from Peads greenhouses were less positive especially where the number of fruits are concerned. It is felt however, that the accidental interference during the commercial harvest could have caused the deviation.

It is worthwhile to note that both colour, size and vigour of the foliage of the treated tomato plants has improved. Mr. Currie has remarked that the treated tomatoes have sustained yield capacity longer in comparison to the untreated plants.

4. The yield and quality of the potatoes were not improved by the of application of the seaweed extract. Also there was no effect on potato beetle. The data is presented in Table 4.

ABNORMALITIES: The consistency (unclear and contaminated with solid parts) of the seaweed extract has interfered with the foliar application of the product. It prevented the uniform application and caused spraying equipment to fail so that a coarser application method had to be established for spraying. The late delivery of the product also gave less than optimum conditions for the evaluation.

Weather patterns during the 1991 growing season were extreme. The prolonged drought during June and July had significantly affected the performance of potato crops and may have also contributed to the experienced data variability.

The yield data of tomatoes (Peads) and Broccoli (Banks) may have been affected by an accidental interference during the commercial harvest.

TABLE 3

The Effect of Foliar Application of Seaweed Extract on Yield of Greenhouse Tomatoes

Site	Treatment*	Average Yield Per Plot (gm)	Deviation From Average (%)	Significance at 0.05 Level
Curries (Devon, soil media)	1	1,162.13	----	A
	2	1,349.38	+ 16.11	A
	3	1,403.23	+ 20.75	A
		Ave. # of Fruits Per Plot		
	1	9.75	----	A
	2	13.25	+ 35.90	A
	3	11.75	+ 20.51	A
		Ave. Yield Per Plot (gm)		
Peads (Minto, hydroponics)	1	1,685.04	----	A
	2	1,466.15	- 14.93	A
	3	2,316.44	+ 37.47	A
		Ave. # of Fruits Per Plot		
	1	20.0	----	A
	2	14.5	- 37.93	A
	3	15.5	- 29.03	A

* 1 Control (Water)
2 Recommended Rate
3 2 x Recommended Rate

TABLE 4

The Effect of Foliar Application of Seaweed Extract on Yield and Quality of Potatoes

Site	* Treatment	Average Yield of Tubers per Plot (kg)					Yield of Tubers (T/ha)	Average Specific Gravity
		Jumbo	Canada #1	Canada #2	Cull & Peanuts	Total		
Conrad Toner	1	2.87	1.68	0.33	0.11	4.99	9.14	1.0517
Grand Falls	2	2.39	2.24	0.24	0.02	4.89	9.07	1.0475
(sandy loam)	3	2.29	1.80	0.48	0.02	4.59	8.59	1.0365
Superior								
Dwaine White	1	6.01	4.13	0.74	0.04	10.92	20.22	1.0927
Debec	2	5.40	4.22	0.48	0.04	10.14	18.78	1.0949
(loam)	3	4.30	5.73	0.90	0.10	11.03	20.42	1.0919
Russet Burbank								

*	
1	control (water)
2	recommended rate
3	2 x recommended rate

RECOMMENDATIONS: Since the results of this investigation support the claims of crop yield and quality improvement, but also due to external forces that have had a negative effect on data variability it is recommended that further investigations be carried out. Of particular interest would be semi-commercial trials investigating the effects of seaweed extract on the yield and quality of potatoes grown on eroded soils of the New Brunswick Potato belt.

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1991 EASTERN CANADIAN DRY BEAN CO-OP TEST - WOODSTOCK NEW BRUNSWICK.

G.E. Chevrier, J. Baker, C. & A. Van Dine.

ABSTRACT: Forty-two dry bean cultivars were evaluated for their performance under N.B growing conditions in 1991. Favourable growing conditions resulted in high yields, low % picks and early flowering for a number of cultivars. Among white bean cultivars, Centralia, OAC Gryphon, Schooner and Stinger produced high yields. Black bean cultivars AC Harblack, Midnight and Panther yielded well but were characteristically slow to mature. RNK 232, Agassiz and ISB 865 (pinto types) performed well. Kidney bean cultivars (Foxfire, RNK 703, Sacramento) had high yields and were the earliest to flower (35-39 days). Black beans Blackhawk, Midnight and Loop were among the latest to flower (56-58 days). Pinto cultivars Topaz, Agassiz and RNK 232 matured the earliest (September 10). The latest to mature (October 3) were Steuben, Aresteuban and Midnight. A brown bean, Berna performed best based on yield, time to maturity, seed quality and % pick.

ESSAI COOPÉRATIF DE L'EST DU CANADA SUR LE HARICOT SEC - WOODSTOCK (NOUVEAU-BRUNSWICK)

G.E. Chevrier, J. Baker et C. et A. Van Dine

RÉSUMÉ : Nous avons évalué le rendement de quarante-deux cultivars de haricots secs cultivés dans les conditions prévalant au Nouveau-Brunswick en 1991. Des conditions favorables ont entraîné de bons rendements, un pourcentage peu élevé de rejets et une floraison hâtive pour un certain nombre de cultivars. Parmi les cultivars de haricots blancs, les variétés Centralia, OAC Gryphon, Schooner et Stinger ont eu des rendements élevés. Les cultivars de haricots noirs des variétés AC Harblack, Midnight et Panther ont donné de bons rendements, mais étaient de façon caractéristique lents à mûrir. Les variétés RNK 232, Agassiz et ISB 865 (haricots Pinto) ont produit de bons rendements. Les haricots communs (Foxfire, RNK 703 et Sacramento) ont atteint des rendements élevés et étaient les premiers à fleurir (35 à 39 jours). Les haricots noirs des variétés Blackhawk, Midnight et Loop étaient parmi les derniers à fleurir (56 à 58 jours). Les haricots Pinto des variétés Topaz, Agassiz et RNK 232 sont arrivés à maturité les premiers (10 septembre). Les derniers arrivés à maturité étaient les variétés Steuben, Aresteuban et Midnight. Le haricot brun Berna a donné les meilleurs résultats pour ce qui est du rendement, du temps de maturation, de la qualité et du pourcentage de rejets.

INTRODUCTION: The NB dry bean industry has relied on the cultivation of heritage varieties (Jacob's Cattle, Soldier and Yellow Eye) rather than the white navy beans that are produced in Ontario. There is an established market for traditional varieties in NB with approximately 225-250 acres in production. However recent interest in registered cultivars, including white, pinto, kidney, black and brown beans has increased. Problems with seed borne disease, high seed cost, late maturity and low yields encountered with some heritage types have helped to develop this interest.

This trial was established in 1989 and is in its third year of operation. It is run at five sites in Atlantic Canada, in cooperation with dry bean specialists at Centralia College, Huron Park, Ontario. The purpose of the trial is to co-ordinate the evaluation and registration of dry bean cultivars suitable for production in the region. In 1991 the number of cultivars tested was increased to include more black, pinto and yellow eye types.

MATERIALS AND METHODS: Forty - two dry bean cultivars were obtained from Centralia College, Ontario (Table 1). The soil at the test site (Woodstock N.B) was classified as a loam with a pH of 6. Prior to planting, Treflan (ppi) was applied for weed control.The plot was fertilized (banded) with 15-15-15 at a rate of 250 kg/ha. On July 9 the same rate of fertilizer was applied as a side dressing due to the fact that some rows missed the fertilizer during planting. Four single line replicates of each cultivar (5 M long) were planted by hand in a randomized complete block design. Seed was spaced every 4-5 cm along the row (except Midland which were spaced 2-4 cm apart) and the inter-row spacing was 36 inches (91.4 cm). Observations on flowering date, maturity and growth habit were made during the growing season. The middle 3 meters of each row was harvested. Harvesting took place from October 9 to October 29.

RESULTS AND DISCUSSION: Yield data outlined in Table 1 shows that a number of cultivars performed well, with substantial yield increases when compared to 1990 yields. Four white bean market class cultivars Centralia, Stinger, Schooner and OAC Gryphon yielded over 3000 kg/ha while the remaining cultivars in that class yielded well over 2000 kg/ha. Black bean cultivars HR29-DC29, Loop, Midnight and Panther produced yields of over 3000 kg/ha as did RNK 232 (pinto), ISB 865(dark red kidney) and Berna(brown).

Low yielding cultivars (<1600 kg/ha) included Kenearly and Aresteuban, which also performed poorly in 1990. Among new test cultivars, CCY9101, Soldier 91 and HR30-DC29 had poor yields.

In 1990, the percentage pick (grade out) of bean cultivars ranged from 5 to 82% (1) with an average % pick of 42%. This high grade out was caused mainly by wet damp field conditions at harvest. 1991 saw a dramatic improvement with a range of 2 to 43% with an average % pick of 19%. In 1991, percent pick (determined on a weight basis from the total harvested yield) was highest among yellow eye bean cultivars (average 26% pick) and white bean types (average 22%). Losses were low among black beans (average 2-12%) and Berna 4.6%. Wrinkling contributed to losses in pinto and kidney while poor colouring or marking were factors in the white and heritage types respectively.

Table 1 - Comparison of selected yield parameters of dry bean cultivars. Figures for yield and % pick represent the mean of 4 replicates. One hundred seed weight and quality score (1 = excellent, 5 = poor) are based on graded samples.

NAME	MARKET CLASS	YIELD (kg/ha)	% PICK	100 SEED WEIGHT(g)	QUALITY SCORE (1-5)
MITCHELL	white	2500	32	25.3	1
CENTRALIA	white	3593	14	29.2	2
OAC SPRINT	white	2539	25	30.6	2
OAC CYGNUS	white	2289	21	27	2
0AC GRYPHON	white	3455	20	24.7	1
MIDLAND	white	2728	24	21.7	1
STINGER	white	3178	14	23.9	2
T8901	white	2765	15	22.3	1
T8903	white	2191	15	29	1
SCHOONER	white	3112	28	22.4	1
RNK 103	white	2692	32	26.6	3
RNK 303	white	2393	25	25	1
W1169b-23-B	white	2740	20	23.1	1
GTS 0786-2	white	2216	22	25.1	1
DRESDEN	white	2419	26	23.6	1
AC HARBLACK	black	2964	8	24	1

Table 1 - (continued)

NAME	MARKET CLASS	YIELD (kg/ha)	% PICK	100 SEED WGT. (g)	QUALITY SCORE (1-5)
HR29-DC29	black	3258	12	21	1
HR30-DC29	black	1580	5	21.1	2
LOOP	black	3117	6	27.1	1
T-39	black	2479	5	23.3	2
BLACKHAWK	black	2024	3	25.2	1
MIDNIGHT	black	3265	5	23.6	1
PANTHER	black	3067	4	22	1
TOPAZ	pinto	2857	33	43.7	2
AGASSIZ	pinto	2849	11	47.3	1
RNK 232	pinto	3245	13	43.1	2
STEUBEN	yellow eye	1686	42	62.1	2
ARESTEUBEN	yellow eye	1136	43	63.7	2
KENEARLY	yellow eye	1640	3	58.6	1
CCY9101	yellow eye	1446	25	59.2	1
CCY9102	yellow eye	2348	30	60.5	1
CCY9103	yellow eye	2463	16	55.2	1
IG6604	dark red kidney	2136	20	66	2
ISB 865	dark red kidney	3039	13	65.2	2

Table 1 (continued)

NAME	MARKET CLASS	YIELD (kg\ha)	% PICK	100 SEED WGT. (g)	QUALITY SCORE (1-5)
SACRAMENTO	light red kidney	2215	23	67	3
FOXFIRE	light red kidney	2682	21	61.7	3
RNK 703	light red kidney	2558	16	52.7	2
NS-N-1	marrow	1970	22	44.8	1
JACOB'S CATTLE	heirloom	1807	16	69.6	2
SOLDIER 90	heirloom	2189	20	76.2	2
SOLDIER 91	heirloom	1498	17	60.4	2
BERNA	brown	3047	5	56.7	1

Table 2 - Comparison of flowering date, time to maturity, harvest date and growth habit of dry bean cultivars.

Name	Time to flowering	Time to maturity	Harvest date	Growth habit
MITCHELL	July 26 (48)	September 10	October 9	1
CENTRALIA	July 24 (46)	September 16	October 9	2B
OAC SPRINT	July 27 (49)	September 10	October 24	1
OAC CYGNUS	July 22 (44)	September 16	October 9	1
OAC GRYPHON	July 31 (53)	September 16	October 9	3A
MIDLAND	July 22 (44)	September 10	October 9	1
STINGER	July 30 (52)	September 16	October 9	2B
T8901	August 1 (54)	September 10	October 11	1
T8903	August 3 (56)	September 16	October 15	1
SCHOONER	July 21 (43)	September 10	October 11	2
RNK 103	July 22 (44)	September 30	October 11	3B
RNK 303	August 1 (54)	September 10	October 11	1
W1169b-23-B	July 23 (45)	September 10	October 22	1
GTS 0786-2	August 1 (54)	September 10	October 11	1
DRESDEN	July 26 (48)	September 16	October 9	1
AC HARBLACK	July 22 (44)	September 30	October 24	1

*Growth habit-CIAT classification 1 = determinate bush, 2 = upright indeterminate vine, 3 = prostrate indeterminate vine, A = short vine, B = long vine.

Table 2 (continued)

Name	Time to flowering	Time to maturity	Harvest date	Growth habit
T-39	August 2 (55)	September 30	October 9	3A
BLACKHAWK	August 5 (58)	September 16	October 24	1
MIDNIGHT	August 4 (57)	October 3	October 24	1
PANTHER	July 28 (50)	September 30	October 9	1
TOPAZ	July 23 (45)	September 7	October 9	3B
AGASSIZ	July 27 (49)	September 7	October 9	1
RNK 232	July 27 (49)	September 7	October 9	1
STEUBEN	July 25 (47)	October 3	October 24	3A
ARESTEUBEN	July 23 (45)	October 3	October 29	3B
KENEARLY	July 21 (43)	September 16	October 7	1
CCY9101	July 20 (42)	September 16	October 24	1
CCY9102	July 20 (42)	September 16	October 22	1
CCY9203	July 24 (45)	September 16	October 24	1
IG6604	July 25 (46)	September 30	October 24	1
ISB 865	July 21 (43)	September 16	October 9	1
SACRAMENTO	July 13 (35)	September 16	October 11	1
FOXFIRE	July 17 (39)	September 30	October 29	1
RNK 703	July 15 (37)	September 10	October 9	1
NS-N-1	July 20 (42)	September 10	October 9	1

Table 2 (continued)

Name	Time to flowering	Time to maturity	Harvest date	Growth habit
HR29-DC29	August 4 (57)	September 10	October 9	2
HR30-DC29	August 3 (56)	September 16	October 11	2
LOOP	August 4 (57)	September 30	October 29	1
BERNA	July 21 (43)	September 10	October 9	1
JACOB'S CATTLE	July 21 (43)	September 10	October 9	1
SOLDIER 90	July 21 (43)	September 10	October 9	1
SOLDIER 91	July 21 (43)	September 10	October 9	1

The dry conditions experienced during late spring and summer did not appear to effect the yields of most cultivars. Visual evaluation of pods during August did reveal some shrunken seed (1 in 5 seeds per pod) that could be attributed to the lack of moisture during early pod formation. This was a problem reported by producers throughout NB. Reasonable quality at harvest could be attributed to the timely rain received during August and the fact that weather permitted a productive harvest during October in the Woodstock region. No major disease problems were observed during the growing season, other than anthracnose on Steuben bean pods.

One hundred seed weight and quality scores (Table 1) were based on graded samples. It follows from the low % pick among cultivars that the quality ratings were high. Quality scores were consistently high for all cultivars representing all market classes. Only three cultivars were given a rating over 2. Schooner a white bean was undersized and discoloured, while Foxfire and Sacramento (light red kidney) were smaller and discoloured in the hilum area.

Chronological observations for flowering, maturity and harvest date are summarized in Table 2. Light red kidney cultivars Sacramento, RNK 703 and Foxfire were earliest to flower within 35-39 days from planting. White, pinto and heirloom type beans were slower taking from 42-50 days to flower. Among the latest flowering were black bean cultivars Blackhawk, Midnight, Loop and HR29-DC29 (57-58 days).

Maturity was determined by leaf senescence, pod colour and bean seed development. Topaz, Agassiz and RNK 232 were the earliest to mature on September 7. Mitchell, OAC Sprint, HR29-DC29 and all the heirloom and brown beans were mature on September 10. The latest beans to mature (October 3) were Steuben, Aresteuben, and Midnight. Harvests were taken on the 9,11,15,22,24 and 29th of October.

CONCLUSIONS: 1991 was a productive year for the dry bean trial largely because of cooperative weather at harvest which allowed for all cultivars to be harvested and dried with a minimal amount of moulding and spoilage. The best cultivar overall (based on earliness to flower, yield and quality) was the brown type, Berna. The kidney and white bean types performed quite well in terms of yield, % pick and flowering. Due to the length of time it takes for black beans to mature and the uncertain conditions at harvest in October, it could be considered a risk to grow them on a commercial scale. The yields for black beans were high in this trial due to the fact that the plots were all hand harvested. Commercial growers in the Woodstock region reported some losses as wet conditions made it impossible to move harvest equipment into the field.

Two of the new CCY lines (CCY9102 and CCY9103) had high yields, relatively low % picks, early flowering and high quality seed. Yellow Eye and heirloom cultivars did not perform as well as other bean types. Specifically, yields were low for the heirloom types. Yellow Eye cultivar yields were modest and time to maturity consistently longer than other bean types.

Centralia, ISB 865, Sacramento and Agassiz were noted as having performed well under 1990 test conditions. These cultivars proved to be consistent again in 1991 and should be included in future evaluations.

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REFERENCES: Chevrier,G.E.,L.Rankin and C.VanDine.1990. Eastern Canadian Dry Bean Coop Test- New Brunswick. NBDA Adaptive Research Reports. 12:51-58.

EARLY SEASON CAULIFLOWER AND BROCCOLI CULTIVAR EVALUATION- 1991

G.E. Chevrier and J. Baker

ABSTRACT: Early season cauliflower and broccoli cultivars were grown at Sheffield and Sussex N.B. and evaluated for yield and quality. No harvest data was collected at the Sussex site due to a late frost (May 22) and drought conditions which severely stunted growth. Irrigation applied during the drought contributed to high yield percentages among the majority of cauliflower and broccoli cultivars grown in Sheffield. Broccoli cultivars that were harvested early included; Buccaneer, Embassy, Arcadia and Sprinter. Buccaneer was earlier to 50 % harvest (July 12) than all other cultivars, whereas Pinnacle was latest (July 30). Premium Crop, Buccaneer, Greenbelt, Green Valiant and Cruiser were all fairly even at maturing. Embassy and Arcadia were displayed uneven maturity rates at 9 and 13 days respectively. Early cauliflower cultivars included Calypso and Keijer initially harvested July 10. Some high quality cultivars were very late to initial and 50 % harvest. These included, Andes, Sierra and White Rock. The majority of cultivars grown were uneven at maturing. Calypso and Andes were the exceptions reaching 50% harvest within 2 days of initial harvest.

ESSAI DE VARIÉTÉS HÂTIVES DE BROCOLI ET DE CHOU-FLEUR - 1991

G.E. Chevrier et J. Baker

RÉSUMÉ : On a cultivé des variétés hâtives de brocoli et de chou-fleur à Sheffield et à Sussex, au Nouveau-Brunswick, aux fins d'évaluation du rendement et de la qualité. En raison d'un gel tardif (22 mai) et d'une période de sécheresse qui ont gravement retardé la croissance des cultivars, aucune donnée n'a été fournie sur les récoltes à Sussex. L'irrigation des champs à Sheffield durant la période de sécheresse a contribué à un rendement élevé pour la majorité des cultivars de brocoli et de chou-fleur. Parmi les cultivars de brocoli ayant connu une récolte hâtive, on trouve les variétés Buccaneer, Embassy, Arcadia et Sprinter. La variété Buccaneer était la première à atteindre un taux de récolte de 50 % (12 juillet) et la variété Pinnacle, la dernière. Le temps de maturation était à peu près le même pour les variétés Premium Crop, Buccaneer, Greenbelt, Green Valiant et Cruiser. Le temps de maturation des variétés Embassy et Arcadia, 9 et 13 jours respectivement, était très différent. Parmi les cultivars hâtifs de chou-fleur, on trouve les variétés Calypso et Keijer dont la récolte a débuté le 10 juillet. Certains cultivars de haute qualité ont pris du temps à mûrir et à atteindre un taux de récolte de 50 %. Il s'agit des variétés Andes, Sierra et White Rock. La majorité des variétés cultivées ont eu une maturation inégale des cultivars, sauf Calypso et Andes qui ont atteint un taux de récolte de 50 % deux jours après le début de la récolte.

INTRODUCTION: Horticultural producers have long established the tradition of growing crops for early market production in order to capitalize on high prices. The way to achieve early market production in broccoli and cauliflower is through the proper selection of early maturing cultivars. Cultivar selection is difficult among these cole crops as many early cultivars have poor wrapper development, large bead size and lack compactness. This trial established in 1989 will continue to evaluate various early season broccoli and cauliflower cultivars.

MATERIALS AND METHODS: Eleven broccoli and twelve cauliflower cultivars were grown at two sites; Sheffield and Sussex N.B. The seed for both trials was supplied by Paul V. LeBlanc (Agriculture Canada). A Randomized Complete Block Design was used with single line replicates. Four replicates were used. Plant spacing was 16 inches (40 cm) within the rows and 36 inches (90 cm) between rows. All cultivars were seeded on April 12 in commercially prepared growing mix (ASB) and grown in Plastomer 200 seedling trays at each site. Field transplanting took place at Sussex on May 22 (broccoli) and May 23 (cauliflower). Transplanting took place in Sheffield on May 29 (broccoli) and May 30 (cauliflower). Harvesting was done every four days from July 10 - August 16. Lime and fertilizer applications were as outlined by soil analysis reports.

RESULTS AND DISCUSSION: Data from the Sussex site was insufficient to perform quality ratings or statistical analysis on harvests. This was due to a heavy frost on May 22 and drought conditions during the growing season that severely stunted plant growth.

Broccoli: Table 1 outlines harvested yield data from the Sheffield site. Irrigation applied during the dry period prevented slow, stunted plant growth. Arcadia, Emperor, Premium Crop, Pinnacle and Greenbelt produced head sizes (15.9-17.2 cm) significantly larger than other cultivars. Sprinter was significantly smaller than all other cultivars (11.5 cm). The cultivar Early Dawn was not analyzed due to insufficient data. According to head weight, Arcadia, Emperor, Premium Crop, Pinnacle, Greenbelt and Green Valiant, were not significantly different from each other all producing heavy heads (474 - 494 g). Buccaneer, Cruiser, Embassy and Sprinter were lighter than the other cultivars but not significantly different from each other, producing heads between 275-275 g.

Table 2 outlines initial and 50% harvest dates for broccoli cultivars. The early cultivars to initial harvest were Buccaneer and Embassy (July 10), followed by Sprinter and Arcadia on July 12. The majority of cultivars were initially harvested mid-season (July 18-22). Pinnacle was the latest cultivar initially harvested July 25. Overall this years crop was first harvested later (41-56 days form transplant) than the 1990 crop (1) at the Sheffield site (36-58 days from transplant).

Buccaneer was the earliest cultivar to 50% harvest (July 12) while Pinnacle was the latest to reach 50% on July 30. The majority of cultivars reached 50% harvest between July 19-July 25). Premium crop displayed the most evenness in maturity having 50% of the crop harvested on the same day. Cruiser, Buccaneer, Green Valiant, Greenbelt, and Midori 71 were fairly even in maturity (2-3 days from initial to 50% harvest). In comparison, Embassy and Arcadia did not mature evenly (9,13 days between initial and 50% harvest).

Table 1: Harvest data for broccoli grown in Sheffield. Values represent the mean of 4 replicates.

Cultivar	**Diameter (cm)**	**Head wgt. (g)**	**% Harvested**
Arcadia	17.2 a	493.7 a	86
Emperor	17.0 a	431.38 a	87
Premium Crop	16.5 a	417.65 a	86
Pinnacle	16.5 a	444.7 a	83
Greenbelt	15.9 a	477.0 a	94
Green Valiant	15.6 ab	473.7 a	92
Buccaneer	13.9 bc	275.4 b	58
Cruiser	13.8 bc	315.9 b	83
Embassy	12.9 cd	271.6 b	83
Sprinter	11.5 d	277.1 b	83
*Midori 71	--------	--------	29

*Not sufficient data to perform analysis. Means separation within columns by Duncan's Multiple Range Test. (P=0.05)

TABLE 2: - Time to initial and 50% harvest of broccoli cultivars grown in Sheffield. Values in brackets represent actual number of days from transplant. Based on the mean of 4 replicates.

Cultivar	Initial Harvest	50 % Harvest
Buccaneer	July 10 (41)	July 12 (43)
Premium Crop	July 22 (53)	July 22 (53)
Sprinter	July 12 (43)	July 18 (49)
Cruiser	July 18 (49)	July 19 (50)
Embassy	July 10 (41)	July 19 (50)
Emperor	July 19 (50)	July 22 (53)
Green Valiant	July 22 (53)	July 25 (56)
Greenbelt	July 22 (53)	July 25 (56)
Pinnacle	July 25 (56)	July 30 (61)
Arcadia	July 12 (43)	July 25 (56)
Midori 71	July 19 (50)	July 22 (53)

*** Insufficient data for the cultivar Early Dawn**

Quality characteristics for bead size, yellow eye and compactness were estimated from the data collected at the Sheffield site (Table 3). Smallest bead size was noted in cultivars Midori 71, Pinnacle, Greenbelt and Emperor. Larger bead size was characteristic of cultivars Buccaneer, Sprinter and Embassy. Buccaneer produced very large uneven heads at maturity as did Sprinter, Green Valiant and Greenbelt. The most compact heads were produced by cvs. Midori 71 and Premium Crop. Yellow eye was common among all cultivars and was especially noticeable in cultivars, Arcadia,Emperor, Midori 71 and Greenbelt.

Observations showed significant differences for hollow stem among cultivars. Midori 71 was totally free from this trait (0%). Cultivars Greenbelt and Buccaneer had low percentages of 16 and 17 respectively. Arcadia had 83% hollow stem and Pinnacle 70%. The remaining cultivars had fairly high percentages ranging from 33-62%. Bract leaf development was not a problem at the Sheffield site.

The following comments summarize some of the more important characteristics among cultivars. Arcadia,

Table 3 - Cultivar & Market Quality Characteristics of Broccoli

Cultivar	Cultivar Characteristics			Market Quality Characteristics	
	Head Size	Yellow Eye	Compactness	% Hollow Stem	Leafiness
Buccaneer	2.8	2.0	3.2	17	1.5
Premium Crop	2.0	1.9	1.5	62	1.5
Sprinter	2.7	2.1	2.8	45	1.5
Cruiser	2.2	1.8	2.3	40	1.2
Embassy	2.7	1.7	2.4	33	1.1
Emperor	1.9	2.8	2.0	47	1.0
Green Valiant	2.2	2.5	2.7	56	1.2
Greenbelt	1.8	2.6	2.6	16	1.0
Pinnacle	1.5	2.2	2.3	70	1.4
Midori 71	1.1	2.6	1.2	0	1.0
Arcadia	2.0	2.9	2.2	83	1.6

*Based on average characteristics of crops at Sheffield site. Head size rated 1-5 (small to very large). Yellow eye rate (1-3 (not apparent to severe). Compactness rated 1-5 (very tight to loose).

Emperor and Premium Crop were top quality cultivars with compact heads tender stalks and relatively good colour. Sprinter and Cruiser were average cultivars with exceptional colour. Green Valiant and Greenbelt have very small bead size, however Greenbelt had thick stalks and Green Valiant had an irregular domed head and a high incidence of yellow eye. Buccaneer and Embassy were under average quality compared with other cultivars, particularly Embassy which exhibited, purple discoloration on the beads and a woody ring inside the stem making them difficult to cut. The cultivar Early Dawn was a complete failure having over 90% of plants bolt.

Cauliflower: Harvest data (Table 4) and marketable yield (percent of crop harvested) illustrate the advantage of irrigation at the site. Ten of the twelve cultivars evaluated had a harvest percentage of greater than 82%. Only Junal and Calypso were under 70% having harvests of 69% and 65% respectively. Andes and Fremont had significantly larger diameters than all other cultivars. Calypso was significantly smaller than other cultivars. According to head weight Fremont was significantly heavier than all other cultivars, whereas Calypso significantly lighter.

Table 5 shows that Calypso and Kiejer were the first to be harvested on July 10. Junal, Siria and Ravella were harvested before July 26. The last to be harvested were Sierra, Solide, White Rock and Fremont all harvested after July 30.

Calypso was the earliest to 50% harvest and was very even in maturity (2 days between initial and 50% harvest). Andes was the most even at maturing with 50% of the crop harvested on the initial date. However initial harvest of Andes was the latest among cultivars (August 2). Fremont and Ravella displayed relatively even periods of maturing (3-5 days). The remaining cultivars were slow to 50 % harvest and uneven in maturity (7-15 days to maturity).

Quality observations were made on marketable curds and summarized in Table 6. Junal was the only cultivar to show any significant amount of leafiness (2.2). Poor wrapper development resulted in undesirable curd colour in cultivars Junal (very yellow), Keijer, and Calypso. Sierra, Fremont, Andes and White Rock were of excellent colour quality. Pubescence was a major problem in the cultivar Junal where a large percentage of curds were unmarketable. The remaining cultivars were not particularly pubescent. The majority of cultivars were compact. Ravella, Junal and Calypso were slightly less compact.

Table 4: Harvest data for cauliflower cultivars grown at Sheffield. Values represent the mean of 4 replicates.

Cultivar	Diameter (cm)	Head wgt. (g)	% Harvested
Andes	18.2 a	1571.9 ab	86
Sierra	17.9 ab	1492.4 abc	98
Siria	17.6 abc	1381.3 abc	90
Solide	16.9 abcd	1560.7 ab	92
White Top	17.3 abc	1478.6 abc	92
White Rock	16.7 abcd	1615.3 ab	85
Rushmore	17.6 abc	1278.6 bc	90
Ravella	16.7 abcd	1275.6 bc	92
Junal	16.2 bcd	1190.9 c	69
Kiejer	16 cd	852.6 d	94
Calypso	15.4 d	532.9 e	65
Fremont	18.1 a	1673 a	92

*Means separation within columns by Duncan's Multiple Range Test (P=0.05)

Table 5: Time to initial and 50% harvest of cauliflower Cultivars grown in Sheffield. Values represent actual number of days from transplant. Based on the mean of 4 replicates.

Cultivar	Initial Harvest	50 % Harvest
Andes	August 2 (64)	August 2 (64)
Calypso	July 10 (40)	July 12 (42)
Junal	July 18 (48)	July 30 (61)
Kiejer	July 10 (40)	July 25 (56)
Fremont	July 30 (61)	August 2 (64)
White Top	July 30 (61)	August 12 (74)
White Rock	August 2 (64)	August 12 (74)
Solide	July 30 (61)	August 6 (67)
Sierra	August 2 (64)	August 12 (74)
Siria	July 25 (56)	July 31 (62)
Ravella	July 25 (56)	July 30 (61)
Rushmore	July 22 (53)	July 30 (61)

Table 6 - Cauliflower quality observations (from marketable heads) summarized from data recorded at the Sheffield trial site.

CULTIVAR	QUALITY CHARACTERISTICS* LEAFINESS	COLOUR	PUBESCENCE	COM-PACT-NESS
Andes	1.0	1.9	2.0	2.3
Calypso	1.3	2.6	1.6	2.9
Junal	2.2	3.4	3.9	3.0
Kiejer	1.4	2.7	2.3	2.8
Fremomt	1.0	1.9	2.0	2.6
White top	1.3	2.4	2.3	2.7
White rock	1.0	1.9	2.0	2.0
Solide	1.1	2.4	2.3	2.6
Sierra	1.0	1.4	1.9	2.2
Siria	1.0	2.1	2.7	2.4
Ravella	1.0	2.4	2.7	3.0
Rushmore	1.0	2.3	2.1	2.5

*Ranking: Leafiness (1=no leaves in curd, 3= Unsaleable) Colour (1= white, 4= yellow) Pubescence (1= no hairs 4= Severe) Compactness (1= tight curd 5= excessively loose)

The following comments summarize the more important characteristics among cultivars. Midori 71 was an extremely poor cultivar harvesting only 27% the majority of which were of poor quality. Junal had poor wrapper leaves and rated poorly on all quality observations. It harvested only 69% and was small compared to other cultivars. Ravella and White Top were susceptible to rot and tip burn. Both had uneven heads and were generally poor quality cultivars. Sierra had excellent wrapper leaves and displayed the best colour and size of all cultivars. Fremont and White Rock were of extremely good quality both developing good wrapper leaves, size and colour. Kiejer, Calypso, Siria and Solide were average cultivars all slightly flawed with regard to colour and pubescence. Rushmore and Andes were fairly large with incomplete wrappers.

CONCLUSIONS: Irrigation applied at the Sheffield site was the major factor attributing to high yield percentages. In Sussex, frost combined with drought conditions during early summer resulted in stunted growth and reduced yields for broccoli. The entire planting of cauliflower was lost to drought.
At the Sheffield site Buccaneer and Cruiser were the only two cultivars that displayed, earliness to initial harvest, earliness to 50% harvest and an even maturity rating. Buccaneer was not a good quality cultivar however Cruiser was making it one of the most desirable cultivars overall. Arcadia was of excellent quality other than a problem with hollow stem and an uneven rate of maturity.

The most important conclusion to realized among cauliflower cultivars was the tendency among the highest quality cultivars to be slow at maturing. For example, Sierra, Fremont and White rock were initially harvested after July 30 and their harvest periods lasted longer than 6 days. The earliest cultivars Calypso and Kiejer were average cultivars mainly due to poor wrapper leaves.

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EVALUATION OF PLASTIC MULCHES FOR CUCUMBER AND MUSKMELON PRODUCTION[1]

G.Chevrier, G.Read and J.Baker

ABSTRACT: Direct seeded cucumber (cv.Marketmore 76) and transplanted muskmelon (cv.Alaska Hybrid) crops were grown in seven different mulch films and compared to bare soil control. All mulch treatments, with the exception of white on black film, increased soil temperatures when compared to control plots. The greatest temperature increase was noted with wavelength selective AL-OR and Thermal Opaque films. AL-OR plots produced the highest number of grade A and B fruits and total weight of cucumbers. Time to 50% harvest of muskmelon fruits was earliest in AL-OR and Climagro plots whereas Thermal Opaque plots produced the highest number of marketable fruits. Yield advantages were obtained with wavelength selective materials, however the higher cost of these films may limit their acceptance.

ÉVALUATION DES PAILLIS DE PLASTIQUE POUR LA PRODUCTION DU CONCOMBRE ET DU MELON BRODÉ[1]

G. Chevrier, G. Read et J. Baker

RÉSUMÉ : On a planté directement à la graine du concombre (principale variété Marketmore 76) et transplanté du melon brodé (principale variété Alaska Hybrid) sur un sol recouvert de sept différents paillis et sur des parcelles témoins non paillées. Sous tous les paillis, sauf le paillis blanc sur du plastique noir, la température du sol était plus élevée que celle sur les parcelles témoins. On a remarqué la plus forte hausse de température avec la pellicule AL-OR d'absorption sélective et les plastiques thermiques opaques. Les parcelles recouvertes de la pellicule AL-OR ont produit le plus grand nombre de fruits de qualité A et B et le plus grand poids total de concombres. Le écoulé entre la plantation et la récolte à 50 % de melons brodés était le plus court pour les parcelles recouvertes des pellicules AL-OR et Climagro alors que les plastiques thermiques opaques ont produit le plus grand nombre de fruits vendables. De meilleurs rendements ont été obtenus avec les pellicules d'absorption sélective, toutefois le coût élevé de ces pellicules peut les rendre moins acceptables.

INTRODUCTION: Warm season crops like cucumber and melon respond favourably to plastic mulches (1) because of the benefits associated with soil warming, moisture conservation, weed and disease control. A great deal of experimentation has been conducted on a range of vegetable crops and different combinations of mulching and row cover materials (Chu, 1984; Hemphill and Clough, 1990; Reed and Clough, 1989;Wells and Loy, 1985.) to determine the most suitable microclimate for maximum production.

Surface applied black plastic films are common inputs in NB vegetable production since soil heat retention and temperature elevation play a significant role in areas where cool spring soil temperatures can be a limiting factor (Hemphill and Clough, 1990). One limitation of black plastic films is that they tend to absorb infra-red heat thereby limiting the conduction of heat energy to areas where the plastic is in direct contact with the soil surface. The recent development of infra-red transmitting "IRT" (Loy and Wells, 1989; Loy and Wells, 1990) and wavelength selective materials holds promise of increasing the efficiency of heat transfer to the soil. Weed control is not a problem since these new photo-selective materials screen out photosynthetically active radiation "PAR" which allows weed seeds to germinate.

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[1] Les noms commerciaux utilisés dans la présente publication servent uniquement aux fins d'identification. Cela ne signifie nullement que le ministère de l'Agriculture du Nouveau-Brunswick recommande ou déconseille l'utilisation de ces produits à l'exclusion de tout autre produit analogue nommé.

[1] Use of trade names in this publication is solely for identification. No endorsement of the products named is implied by N.B. Department of Agriculture, nor is discrimination inteneded to the exclusion of similar products named.

This study was conducted to evaluate different plastic materials in the production of cucumber and muskmelon. IRT, wavelength selective and conventional materials were used in comparison to control treatments. Clear plastic materials were excluded because of the dominant weed species present at the trial site (*Portulaca oleracea*) and lack of registered herbicides to control this weed in cucurbits.

MATERIALS AND METHODS:

Cucumber - The trial was conducted at the NB Agriculture Horticulture Research Station at Hoyt,NB. Prior to planting, the site (loamy sand) was limed to a pH of 6.3 and 10 tons of cattle manure were applied. In addition, 15-15-15 @ 400 kg/ha and gypsum @ 1000 kg/ha were broadcast and disced under. Cucumber (cv. Marketmore 76) seed was sown on June 5 into one of seven mulch treatments or bare soil control. The mulch treatments included three plastic films supplied by PlastiTech Inc of St.Remi, Qc.(photodegradable, Climagro and Thermal Opaque mulches), two films supplied by Lecofilms of Rexdale, On. (black and double extruded white on black film), a green IRT film supplied by Ken-Bar of Reading,Mass.(IRT-76 Sunfilm) and a wavelength selective film supplied by CDK Int. of Marietta,Ga.(AL-OR).

Mulch treatments were applied using a randomized complete block design with 4 replicates. Within rows, plants were spaced at 30 cm (13 plants per row) with an inter row spacing of 1 meter. During the trial, observations on seedling emergence, flowering and yield were recorded. Yields were recorded and graded A,B or C from August 13 to September 13. As well, soil temperatures at depths of 4 cm were monitored.

Muskmelon - Four week old transplants of melon (cv. Alaska Hybrid) were field set on June 10. The transplants were raised in a peat based substrate in 3 inch Jiffy strip pots. The same site preparations as described for cucumber were used as well as a randomized complete block design with 4 replicates. Within rows, melon transplants were spaced at 1.5 meters (7 plants per row) with an inter row spacing of 1.5 meters. Harvest yields were recorded from August 12 to September 13. Fruits were harvested as close to the slip stage as possible. Only saleable fruits were recorded.

RESULTS AND DISCUSSION: No marked differences were noted among treatments for parameters such as seedling emergence and date of flowering. In 1990 test results (Chevrier et al. 1990) these differences were apparent, however in 1991 the trial had to be irrigated frequently just to keep the transplants alive. Consequently plant growth benefits related to soil moisture retention were limited. Time to initial fruit harvest (both melon and cucumbers) showed a time spread of only 2 days among all treatments which was not the case in a more normal year like 1990 when mulch treatments showed clear advantage over control bare soil.

Soil temperatures were however influenced by mulching film. Average soil temperatures (accumulated every six hours and averaged over three days) recorded in mid June showed the control and white/black treatments as having the lowest soil temperatures (figure 1). White/black plastic had a cooling effect when compared to bare soil. Soil temperatures under black plastic were lower than those under Al-OR, Thermal Opaque, IRT-76 and Climagro. Overnight (2400 hrs) soil temperatures were held highest with Climagro. The photodegradable film degraded prematurely and was showing signs of breakdown after two weeks. Perforations in this film would reduce its ability to hold or build up soil temperatures.

Soil temperatures recorded in mid-July (Figure 2) (when vine growth started to cover the mulches) shows roughly the same pattern with Al-OR and Thermal Opaque plastic giving the highest soil temperatures during the day (1800 hrs). White/black plastic had less of a cooling effect, probably because of the vine cover and shading in the bare soil plot. As in Figure 1, Climagro held soil temperatures high into the night. This is advantageous since cucurbit fruit development is greatly enhanced with warm overnight temperatures.

Late August soil temperatures (Figure 3) were not influenced by mulch type. With complete vine cover, soil temperatures were well below the average maximum daily temperature (28 degrees C) recorded during that period.

Cucumber - Harvest data (Table 1) shows that Al-OR produced the highest number of Grade A fruit and total fruit weight among treatments. Grade A fruit number for black plastic plots was as high as most other mulch treatments. Control and Photodegradable treatments produced the fewest number of Grade A and B fruits and lowest total weight yields. Percent Grade A fruits (# Grade A/ # Grade A + # Grade B) was in the range of 38 to 43 % with the exception of Climagro which yielded 34 %. Although cucumbers are sold on a unit basis rather than by weight, the range in total weight data (from 35.3 kg for Photodegradable to 60 kg for Al-OR plots) illustrates the benefit of mulching. With and irrigated trial, perhaps the effect of moisture retention was lost,

Average Temperatures Under Mulch

(Six Hour Intervals, 4 cm depth)

12 pm June 16 until 6 am June 18, 1991

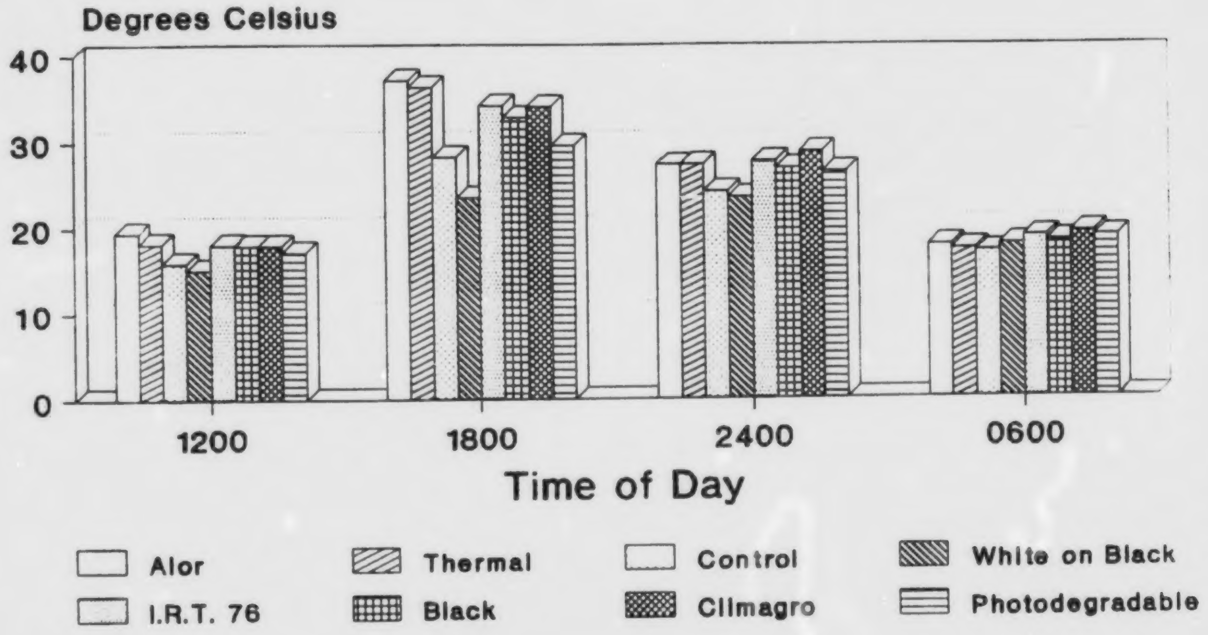

Figure 1

Average Temperatures Under Mulch
(Six Hour Intervals, 4 cm depth)
12 pm July 15 until 6 am July 17, 1991

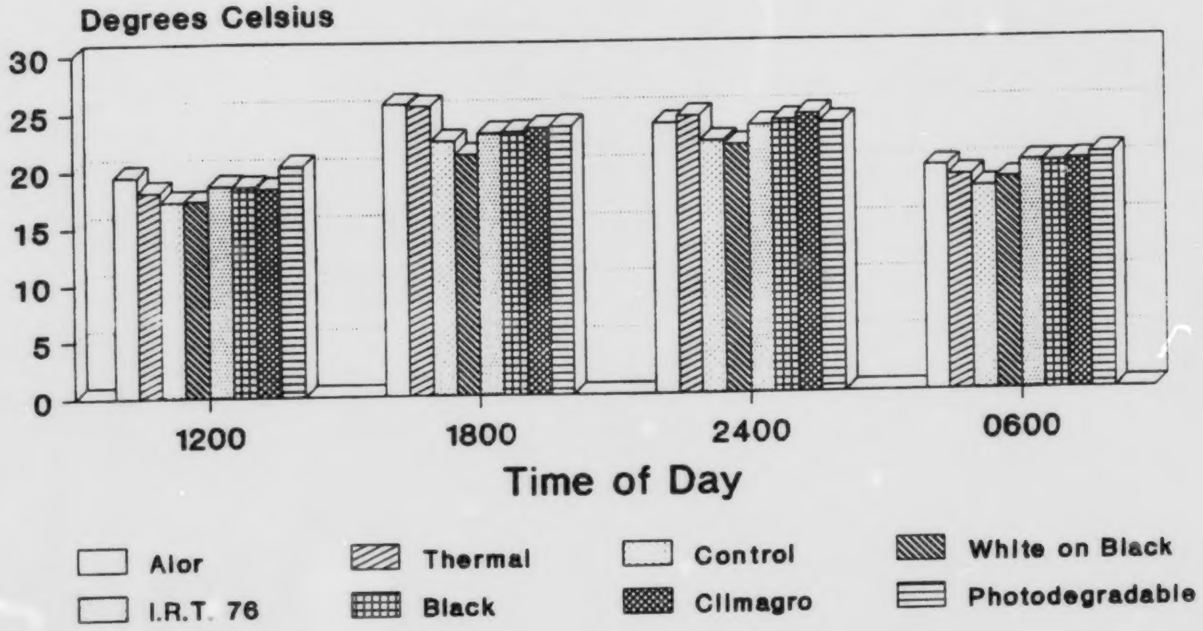

Figure 2

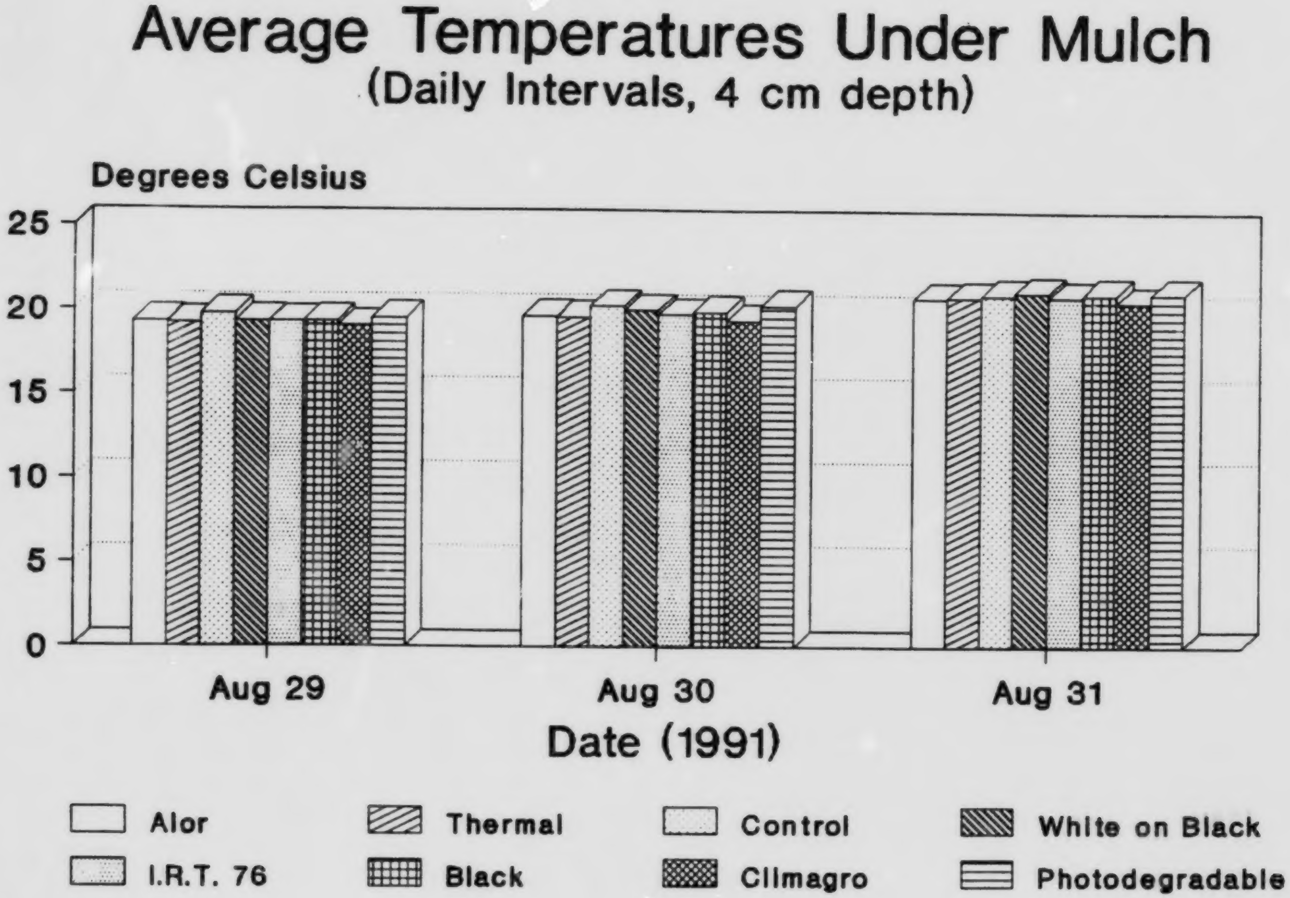
Average Temperatures Under Mulch
(Daily Intervals, 4 cm depth)
Degrees Celsius
25
20
15
10
5
0
Aug 29
Aug 30
Aug 31
Date (1991)
Alor
I.R.T. 76
Thermal
Black
Control
Climagro
White on Black
Photodegradable

Figure 3

TABLE 1: Total harvest weights (kg) and number of A & B grade fruits per group of 13 plants of cucumber (cv. Marketmore 76) grown in various mulch treatments. Each value represents the mean of 4 replicates.

Treatment	No. of Grade A Fruits	No. of Grade B Fruits	Total Weight (kg)
ALOR	50.3 a*	76.0 a	56.0 a
IRT-76	46.8 ab	72.8 a	53.2 ab
CLIMAGRO	40.3 ab	75.6 a	52.1 ab
BLACK	47.0 ab	73.2 a	49.8 abc
THERMAL	47.3 ab	76.0 a	47.0 abc
WHITE/BLACK	44.3 ab	59.3 ab	44.5 bcd
CONTROL	36.8 ab	57.8 ab	40.6 cd
PHOTO	35.0 b	45.8 b	35.3 d

* Means separation within columns by DMRT (P-0.05)

however the increased yields with mulched plots indicate that less nutrients were lost over the growing season due to leaching for the plant root zone.

Muskmelon - Grade A fruit number (Table 2) ranged from 22 (Photodegradable) to 32.5(Thermal Opaque) fruits per plot. Significant differences among treatments were only apparent between these two extremes. Black plastic mulch performed well in comparison to Al-OR and IRT-76 wavelength selective types. Differences among mulch treatments were more apparent in terms of 50% fruit harvest. All mulch treatments reached 50% harvest ahead of the control and Photodegradable plots. Al-OR was one full week earlier than the control plants and 4 days ahead of black plastic plots. The earliest maturing treatment (Al-OR) produced the smallest fruits at 1.48 kg/plant in mid August when temperatures (day and night) were still warm. The heaviest average fruit weights at 1.90 kg/fruit were obtained from the those that matured latest (Photodegradable) when fruit ripening occurred at a slower rate.

Percent Grade A fruits (data not shown) ranged from 76 to 86% with the exception of the control treatments that produced only 69% of fruits that were of top grade.

CONCLUSIONS: When comparing cucumber yield data from 1990 (2) with that of 1991, the same general pattern for performance of mulch materials can be seen. Al-OR and IRT-76 were most productive while White/black, Photodegradable and control treatments were produced lower yields. Muskmelon data is more varied, however the same trend of earlier production with new wavelength selective materials is apparent.

Wavelength selective materials were effective in raising soil temperatures higher than black plastic. Higher soil temperatures advanced time to 50% harvest by as much as 4 days when comparing Al-OR to black plastic and 7 days when control plots are considered.

The results indicate that yield and early market advantages can be obtained with the use of wavelength selective materials. However given the fact that these films are almost twice the price of black plastic, and a 4 to 5 day advantage is realised, they should be used in very early season production and evaluated on a trial basis for main season. The trials conducted in 1990 and 1991 did not involve the use of row covers which would likely enhance the properties of wavelength selective mulches.

ACKNOWLEDGEMENTS: The authors wish to acknowledge the support of the staff at the Hoyt Research Station,NBDA during the course of this trial. This work was funded by CAAFD project B8012-1.

TABLE 2: Harvest weights (kg) and numbers of saleable fruits per group of 7 plants of muskmelon (cv. Alaska Hybrid) grown in various mulch treatments. Each value represents the mean of 4 replicates.

Treatment	No. of Grade A Fruits	Weight (kg) of Grade A Fruits	Date of 50% Harvest
THERMAL	32.5 A*	1.67	8/23
BLACK	31.2 ab	1.57	8/23
ALOR	30.8 ab	1.48	8/19
IRT-76	29.8 ab	1.65	8/21
WHITE/BLACK	29.3 ab	1.70	8/22
CONTROL	27.5 ab	1.61	8/26
CLIMAGRO	26.0 ab	1.64	8/20
PHOTODEG.	22.0 b	1.90	8/29

* Means separation within columns by DMRT (P-0.05)

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ORNAMENTALS/ORNEMENTAUX

REGIONAL BEDDING PLANT TRIALS

A.W.Currie & Staff of the N.B. Horticulture Centre

ABSTRACT: Thirty species of bedding plant cultivars were evaluated during the spring/summer of 1991 at the New Brunswick Horticultural Centre located in Hoyt. Bi-weekly assessments were conducted starting on June 21 based on a comparative rating. In addition, plant measurements were recorded 2 months after planting.

ESSAIS RÉGIONAUX DE PLANTES À REPIQUER

A.W. Currie et personnel du Centre horticole du Nouveau-Brunswick

RÉSUMÉ : Trente cultivars de plants à repiquer ont été évalués au printemps et à l'été de 1991 au Centre horticole du Nouveau-Brunswick à Hoyt. Des évaluations à la quinzaine ont été effectuées à compter du 21 juin en fonction de données comparatives. De plus, la hauteur des plants a été mesurée deux mois après la plantation.

INTRODUCTION: Pack evaluations were carried out prior to field transplantation (June 6). All plants were grown in 806 plastic containers except geraniums which were in 4 inch pots. All material was grown in soilless media which received liquid feed of 15-15-18 water soluble plant fertilizer at 250 ppm of N on a weekly basis. All measurements are in centimetres.

CONCLUSIONS: The growing season during 1991 was extraordinarily good. Plant performance overall was excellent with extended flowering periods. Supplemental bi-weekly liquid feeds of 20-20-20 water soluble fertilizers (300 ppm) aided in enhancing plant growth. The hot dry weather necessitated frequent irrigation. The following tables indicate the various cultivar differences experienced during the growing season.

	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
PLANT NAME ALL AMERICA SELECTIONS	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Pansy AAS Padparadja	25	35	6	3	4.5	5	5	5	4
Pansy F2 Jolly Joker	24	37	5	4	5	5	5	5	4
Vinca Pretty in White	17	20	4	3.5	4	4.5	4	5	5
Pansy F1 Maxim Marina	23	33	5	4	5	5	5	4.5	5
Vinca Pretty in Rose	14	18	4.5	3.5	3	3.5	4	4.5	4.5
Vinca Parasol	20	22	5.5	3	3.5	4.5	4.5	4.5	4.5
Dianthus F. Telstar Picotee	22	33	3	4	5	4.5	4.5	5	5
Dianthus F. Ideal Violet	22	36	3.5	4.5	5	5	5	4.5	5
Creeping Zinnia Mandarin Orange	29	50	2	4	4.5	5	5	5	5
Petunia F1 Ultra Crimson Star	22	35	7.5	4	5	5	4	3.5	2
Petunia F1 Polo Burgundy Star	28	36	8.5	4	4.5	4.5	4	4	2
Petunia Purple Pirouette Grandifl.Dble	29	36	5.5	3.5	4.5	3	4	3.5	2

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
ALL AMERICA SELECTIONS	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Celosia Pink Castle	21	21	4	4	5	5	5	4.5	3
Celosia The New Look	27	27	4	4.5	5	5	5	5	5
Gaillardia Red Plume	40	60	5.5	3.5	4.5	4.5	4	3	1
Salvia Lady In Red	60	60	6	3.5	4	3	4	5	2
Achillea F2 Summer Pastels	31	38	5.5	4.5	4.5	5	5	5	5
Canna Tropical Rose	38	38	13	5	4.5	5	4	4.5	5
Pepper F. Super Chile	26	40	7	5	5	5	5	5	5
Pepper F. Super Cayenne	43	39	7	5	5	5	5	5	5
Watermelon F1 G.Crown	20	86	9.5	3.5	4.5	4.5	5	5	5
Cucumber F1 Salad Bush	25	70	22	4	4	5	4.5	4	4
Squash F1 Trivol	41	65	16	4	4.5	5	4.5	4	4
Squash F1 Cream of the Crop	60	100	9	4.5	4.5	4.5	5	5	3
Pumpkin F1 Autumn Gold	60	-	17	5	5	5	5	4.5	5
Squash F1 Sundrops	40	62	10	3.5	4	5	5	5	3
Okra Burgundy	65	55	21	4	3.5	5	5	5	5

PLANT NAME ALL AMERICA SELECTIONS	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Petunia F1 Orchid Daddy	24	35	8	4	4.5	4.5	4	4	3
Petunia F1 Polo Salmon	24	32	6	4.5	5	5	5	4.5	4
Chrysanthemum Shasta Daisy Snow Lady	20	23	6.5	5	4.5	4	3	3.5	2
Coreopsis Early Sunrise	30	38	5	4.5	5	5	5	5	4
Verbena "Sandy White"	18	22	5.5	5	5	5	5	4	1
Verbena Novalis Deep Blue	19	27	4.5	5	5	5	5	4.5	2
Geranium F1 Freckles	28	35	8	3.5	4.5	5	5	4.5	3
Verbena Peaches & Cream	26	46	6	4	4	4.5	5	5	2
Vinca Pretty in Pink	20	22	5	4	4	4.5	4	5	5
Torenia F1 Clown Mixture	7	19	2	4.5	4	3	4	5	3
Impatiens F1 Tango	28	40	5	3.5	4	4	4.5	5	5
Marigold Golden Gate	22	37	6	4.5	4.5	5	4	4.5	3

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
ALL AMERICA SELECTIONS	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Bean Derby	55	63	18	3	4	5	5	4	3
Dill Fernleaf	43	28	4.5		4	4	5	5	4.5
Carrot Thumbelina	32	21	4	4.5	5	5	5	5	4
Sweet Corn F1 Honey n Pearl	105	80		3	5	5	5	4	4
Bean Kentucky Blue	140	28	2	4.5	5	5	5	5	5

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
SNAPDRAGONS	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Floral Showers Crimson	18	25	6	4	4.5	4	4.5	3	3
Tahiti Yellow	17	40	6	5	5	5	5	4.5	4
Floral Showers Rose Pink	18	27	6	5	5	5	4	5	4
Floral Showers Scarlet	22	34	6	4.5	5	5	5	4.5	3
Floral Showers Lilac	20	26	6	4	4	5	4	5	4
Floral Showers Purple	16	24	6	5	4.5	5	3	3	2
Floral Showers Bronze	16	28	6	4	4.5	4	4	2	2
Tahiti White	16	34	6	4	4	3	4.5	4	3
Sonnet White	33	35	6.5	4	4.5	4	4.5	5	4
Floral Showers Deep Rose	15	25	5.5	5	4.5	5	5	5	2
Sprite Cherry	28	43	6.5	3.5	4	4	4	5	3
Liberty Light Pink	49	28	8	4.5	5	4.5	5	4.5	2.5
Liberty Bronze	41	35	8.5	5	5	4.5	5	4.5	3
Sonnet Yellow	40	33	7	4.5	4.5	5	5	4.5	3
Sprite Yellow	37	42	6	5	5	5	5	5	2.5
Sprite Orange	45	39	7.5	5	5	4.5	4	4.5	2
Sonnet Bronze	35	35	7	5	5	4.5	4.5	5	4

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
SNAPDRAGONS	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Liberty Yellow	45	33	6.5	5	5	4	5	5	4
Liberty lavender	50	40	4.5	5	5	4	5	4	2
Princess White with Purple	26	35	8	4	5	5	5	3	4
Sonnet Pink	37	30	7.5	4	4.5	4.5	5	4.5	2
Sonnet Rose	37	36	7	4.5	5	5	5	5	2.5
Sonnet Orange Scarlet	27	33	7	4	4.5	3.5	4.5	5	4
Liberty White	44	23	7.5	5	5	4	5	4.5	4
Princess White w purple eye	25	36	6	4	5	4	4.5	4.5	1
Sprite Pink	30	28	7	5	5	4.5	4.5	5	4
Liberty Rose Pink	34	40	7	4.5	5	5	5	5	4
Sonnet Carmine	45	30	7	4.5	5	5	5	5	3
Sonnet Crimson	33	32	7.5	4	4.5	5	4.5	5	4
liberty Scarlet	48	40	7.5	4.5	5	5	5	4.5	3
Sprite White	45	40	7	5	4.5	5	5	3.5	4
Sprite Scarlet	25	36	7	4.5	4.5	4.5	5	4	2
Sprite Crimson	51	33	7	4	4	3.5	3	2	1
Liberty Crimson	45	35	7	3.5	4.5	4.5	5	4.5	1.5
Sonnet Burgundy	34	35	7	3.5	4.5	5	5	4.5	3

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Liberty Cherry	42	28	7.5	4.5	5	5	5	3	2
PETUNIAS				June21	July 8	July23	Aug. 8		
Celebrity Burgundy Ice	35	37	6.5	4.5	5	5	4.5		
Primetime Burgundy Star	25	52	7	4	5	5	4		
White Madness	28	56	7	3.5	5	5	5		
Simply Madness	35	50	7	5	5	5	5		
Primetime Blue	33	53	6	4.5	5	5	5		
Primetime Blue Star	24	49	6	4	4.5	4.5	4		
Primetime Rose	25	34	6	5	5	5	5		
Primetime White	29	41	6	4.5	5	5	5		
Primetime Burgundy	33	45	7	3	4	5	5		
Sugar Madness	30	45	7.5	4	4.5	4.5	5		
Silver Madness	40	31	5.5	3	4	4.5	5		
Midnight Madness	26	37	7	4.5	5	5	4.5		
Primetime Lt. Pk.Veined	26	40	7	4	5	4.5	4.5		
Celebrity Hot Pink	29	54	8	4.5	4.5	5	5		

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
PETUNIAS	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Celebrity White	25	29	6	4	5	5	4.5		
Coral Madness	29	45	8	5	4.5	5	4.5		
Pink Madness	28	43	7.5	4.5	5	5	5		
Celebrity Burgundy	33	42	8	5	4	4.5	4.5		
Summer Madness	30	33	6	4	4	4.5	3.5		
Red Madness	35	45	6.5	4	5	4.5	4.5		
Celebrity Blue	24	40	6	4.5	5	4	4		
Celebrity Blue Ice	24	52	8	3.5	4.5	4.5	4		
Roses Madness	33	38	7.5	4.5	5	5	5		
Burgundy Madness	32	44	8	3.5	5	4.5	5		
Primetime Light Blue	28	35	5	4.5	5	5	3		
Primetime Salmon	29	46	7.5	5	5	5	4.5		
Primetime Pink Veined	30	40	7	4	3.5	5	4		
Primetime Plum	32	53	6.5	4.5	4	4.5	4.5		
Orchid Madness	35	32	7	4	4	5	5		
Spring Madness	20	42	8	4.5	4	5	4.5		
Celebrity Summer Ice	30	46	6.5	4	4.5	5	4.5		
Primetime Red	33	44	7	5	4.5	5	4.5		

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
PETUNIAS	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Celebrity Strawberry Ice	25	35	6.5	4.5	4.5	4.5	4		
Primetime Pink	40	48	7	5	5	5	5		
Celebrity Red	26	45	6.5	4.5	5	5	4.5		
Primetime Red Star	28	58	6	4	4	4.5	4		
Sheer Madness	31	55	6.5	4	4.5	5	4.5		
Primetime Madness	36	56	8	4	4	5	5		
Celebrity Salmon	35	47	7	4.5	5	5	4.5		
Celebrity Raspberry Ice	26	46	7	4	4	4.5	4		
COLEUS Coleus Scarlet Poncho	16	25	-	4	4.5	4.5	4.5	4.5	4
Coleus Sober Mix	14	25	-	2	3	2	3	3.5	3
Coleus Poncho Red	20	24	-	2.5	3	2	3	3.5	2
Coleus Fairway Ruby	12	22	-	2	4	4	3.5	3	3
Coleus Color Pride Velvet Rainbow & Volcano	24	30	-	2	3	3.5	3.5	3	3

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
COLEUS	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Coleus Color Pride	26	32	-	2.5	4	4.5	4	5	4
Coleus Ball Rainbow Mix	20	35	-	3	4	2	3.5	4	4
Coleus Carefree Mixed	24	25	-	2	3	2	4	4	2
BASIL Basil Purple Ruffles	28	29	-	4.5	5	5	5	5	5
DIANTHUS Dianthus -Rosemary Salmon	15	22	4	4	4	4.5	4.5	4	2
Rose Carpet	20	27	4	5	5	5	5	5	3
Fire Carpet	30	37	4	4.5	5	5	5	5	5
Telstar mix	28	36	3	5	4	5	5	5	4.5
Strawberry Parfait	18	27	4.5	5	5	4.5	4.5	5	5
Princess Scarlet	32	37	3.5	4	5	5	5	5	3
White Charm	17	25	4.5	5	5	5	5	5	2
Raspberry Parfait	20	32	4.5	4.5	4.5	4.5	5	4.5	3.5
Ideal Rose	30	38	3	3.5	5	5	5	4	3
Pink Flash	22	30	3	3	4	5	3.5	2	2.5
Ideal Deep Violet	37	35	3.5	5	4	5	5	4.5	4
Telstar Purple Picotee	28	34	3.5	4	5	5	5	4.5	4

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
DIANTHUS	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Princess Salmon	30	37	3	5	5	5	5	5	5
Ideal Crimson	35	41	3.5	4.5	5	4.5	5	4.5	3
Telstar Crimson	28	37	2.5	5	5	5	5	4	3
Rosemarie Violet	19	32	5	5	4.5	4.5	4.5	3	2.5
Snow Fire	21	27	4	4	5	4.5	5	5	3
Crimson Carpet	25	31	4.5	5	5	5	5	4	3.5
Telstar Picotee	24	30	3	5	4.5	5	5	5	3
Oriental Carpet	20	33	5	4.5	5	5	4.5	3.5	3.5
Princess Purple	24	30	2.5	4	4.5	5	5	5	3
Telstar White	26	32	3	4.5	4	4.5	5	5	4
Snow Carpet	20	30	4	5	5	5	5	5	5
Telstar Scarlet	27	39	3.5	4.5	5	5	5	3	3.5
Ideal Carmine	27	35	3	3.5	5	4.5	5	5	3
Princess Crimson	28	36	3	4	4.5	5	5	5	4
MARIGOLDS									
Marigold Pumpkin Crush	13	16	7	3.5	4.5	4	4	4	2
Marigold Discovery Yellow	16	27	7	5	5	5	5	5	2.5
Marigold Pineapple Crush	17	23	7	3	4.5	4.5	4.5	5	2

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
MARIGOLDS	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Marigold Discovery Orange	20	29	8	4.5	5	5	5	5	2
Marigold Orange Lady	29	37	7	5	5	5	5	5	3
Marigold First Lady	37	48	8	5	5	5	5	5	3.5
Marigold Voyager Yellow	30	31	9	5	5	4.5	5	4	3.5
Marigold Inca Orange	34	42	11	4.5	4.5	5	5	5	4
Marigold Perfection Gold	36	29	10	5	4.5	5	5	5	4
Marigold Perfection Yellow	37	44	9	5	5	4.5	5	5	4
Marigold Inca Yellow	35	27	10	4	4.5	4.5	5	5	3.5
Marigold Voyager orange	24	27	8	4	4.5	5	5	3	2
Marigold Inca Gold	30	35	11	5	4.5	5	5	5	3
Marigold Voyager Gold	30	39	9	5	5	5	5	5	3.5
Marigold Gold Lady	36	32	7	5	4.5	5	5	5	4.5
Marigold Perfection Orange	36	38	10	5	4.5		5	5	4.5
Marigold Voyager Yellow	30	35	9	5	4.5	5	5	5	4
Marigold Orange Lady	32	44	8	5	5	5	5	3	3.5

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
GERANIUMS	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
Pinto White	46	40	9	5	4	5	5	3	2
Scarlet Elite	30	36	10	4.5	4.5	5	5	2	3
Pinto Red	42	36	9	5	5	5	5	4	4
Orbit Deep Salmon	34	37	10.5	5	5	5	5	2	2.5
Cabaret Pink	28	32	10	4.5	4	4.5	4.5	4.5	3
Orbit Rose	38	30	12	4.5	4.5	5	5	5	4.5
Cabaret Red	32	35	7	5	5	5	5	4	4
Bandit Red	38	43	8.5	4.5	5	4.5	4.5	3.5	4
Orbit Hot Pink	32	35	9	5	5	5	5	5	4
Multibloom Lavender	24	35	9.5	3.5	3.5	4	4.5	4	3.5
Cabaret White	30	28	7	4	4.5	4	4.5	3	2
Geronimo	34	32	9.5	4.5	5	5	5	4.5	3.5

PLANT NAME GERANIUMS	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
	Height	Width	Flower Size	June 21	July 8	July 23	Aug.8	Aug.23	Sept.4
GERANIUMS									
Multibloom White	26	33	6.5	4.5	4.5	4.5	4.5	4	3
Multibloom Salmon	28	32	7	5	5	5	5	4	2
Multibloom Scarlet Eye	26	31	8	5	5	5	5	5	4
Orbit Cardinal	34	40	10	5	5	5	5	4.5	4.5
Orbit Light Salmon	30	33	6	4	4.5	5	5	4.5	4
Cherry Elite	31	36	9.5	5	5	5	5	5	4.5
Multibloom Scarlet	24	25	9	4	5	4.5	5	5	4
Bandit Coral	25	35	8	4.5	5	5	5	5	4
White Elite	24	31	8	5	4.5	4.5	4.5	4	3
Tiffany	38	38	9	5	5	5	5	4.5	4.5
Multibloom Pink	23	28	8	4.5	4	4.5	5	4.5	4.5
Multibloom Bright Rose	30	39	9	5	5	5	5	5	4.5
Multibloom Red	25	24	10	5	5	5	5	4.5	4
Orange Appeal	35	37	9.5	4	5	4.5	5	5	4
Elite Salmon	30	32	8	4	5	5	5	5	4
Elite Pink	29	34	8.5	4.5	4.5	4.5	4.5	4.5	4.5

PROGRESS REPORT ON GREENHOUSE GROWN CUT FLOWERS

A. W. Currie

ABSTRACT: A greenhouse trial was established using 95 various cultivars suitable for fresh and dry cut flower use. All varieties were transplanted in late May and bi-weekly assessments began on July 8th, and continued until Sept. 4th. A number of exceptional varieties were observed during the trial period. In addition, several varieties were also observed to be inappropriate for greenhouse forcing.

RAPPORT D'AVANCEMENT - SERRICULTURE DES FLEURS À COUPER

A.W. Currie

RÉSUMÉ : On a essayé en serre 95 cultivars convenant à la récolte des fleurs coupées fraîches ou séchées. Toutes les variétés ont été transplantées vers la fin mai. On a commencé le 8 juillet des évaluations à la quinzaine qui ont pris fin le 4 septembre. On a observé un certain nombre de variétés exceptionnelles durant la période d'essai. On a également constaté que plusieurs variétés ne convenaient pas au forçage en serre.

INTRODUCTION: Locally grown greenhouse cut flowers are rapidly declining in production throughout eastern North America including New Brunswick. In addition, production of field grown cut flowers is unpredictable at best, given our climatic variability. Seed companies have rapidly expanded their cut flower varieties over the past 2 years. This has resulted in many new and improved cultivars that should be valuable to the cut flower/florist trade. This study initially involved 95 separate cut flower varieties. They were seeded and transplanted in 806 cells in soilless media, grown in a heated greenhouse for eight (8) weeks, then transplanted into an unheated greenhouse structure in May. All varieties were planted through black plastic mulch directly into field soil.

Soil amendments prior to planting included the application of 15-15-15 granular 800 lbs/acre and agricultural gypsum 3500 lb/acre as required by previous soils tests.

Irrigation was supplied by Chappin drip tubes spaced at 18 inch centres running lengthways throughout the entire greenhouse. Daily watering was possible during periods of high temperatures. Ventilation was automatically controlled by a ventilation fan.

Insect control was made possible by the use of Thiodan, insecticide and Vender Miticide when deemed necessary.

Results and Discussion: The following tables illustrate a complete listing of the varieties cultivated. In addition, plant measurements were undertaken two months after planting. These figures are useful as they indicated the area an individual plant occupied during the harvest period.

All measurements are in centimetres.

A bi-weekly assessment evaluated the plant's health and vigour throughout the growing season. This has proven to be a useful tool in distinguishing exceptional varieties.

Some notable varieties were;

The **Verbena** varieties grown were far too short for cut flower purposes and proved useless in these trials.

Bells of Ireland were fairly productive and showed some promise. They seemed to show signs of heat stress periodically and nutrient deficiencies.

Dianthus varieties were too short, however, they did flower over a long period of time.

All varieties of **Helichrysum, Acroctinium, Xeranthemum, and Statice** performed extraordinarily well.

Salpiglossis had an exceptional flower, however it was not able to withstand any length of time in storage.

Larkspur varieties did not perform well.

All **Aster** varieties grew exceedingly well and produced copious amounts of flowers.

Ageratum varieties proved to be an abundant yielder.

Amaranthus and Cosmos flowered well, unfortunately they were much too large and tended to snap off near weak stem axils during training or harvest.

Centaurea varieties performed well, yet they lacked longevity over the full season.

Safflower did extremely well, however the sheer bulk of the plant and its attractiveness to insect pests such as whitefly and aphid, make its usefulness limited.

Zinnia cultivars did very well. Smaller flowering types would be more useful for florists, than the larger cactus types grown in this trial.

CONCLUSIONS: The enhanced climate and accentuated growth possible in a greenhouse structure has shown that these types of crops may be readily grown. Over twenty types of flowers and numerous varieties within these types are suitable for greenhouse culture.

Traditional greenhouse cut flower crops such as mums, roses, alstromeria, gypsophila, iris and carnations are widely cultivated. These crops are declining in North America as Central and South America are producing these crops in abundance at extremely low costs of production. This situation has dramatically reduced the viability of cut flower ranges in North America.

The plant material studies in these trials should offer greenhouse producers suggestions for alternate crops. The ideal situation should occur when these crops are grown as companion crops or sequence crops in bedding plant ranges. Secondly, the most prominent varieties can serve as an excellent source of dried material suitable for year-round sales.

The selection of the twenty cultivars which were most promising will be hopefully more fully studied in the 1992 growing season.

This project was fully funded by the Canada-New Brunswick Cooperative Agreement on Agriculture under the Technology Demonstration Component.

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)				
	Height	Width	Flower Size	July 8	July 23	Aug.8	Aug.23	Sept.4
Verbena Genesis Showtime Mix	23	38	6	4	4	4.5	5	4.5
Verbena Genesis Romance Mix	20	40	6	4	4	4.5	5	4.5
Verbena Trinidad	25	39	5.5	4.5	5	3.5	5	5
Verbena Genesis Valentine	20	43	6	4	5	5	5	4
Showtime Belle Verbena	17	45	6	3.5	5	5	5	5
Bells of Ireland	56	14	2.5	4	5	4.5	4.5	4.5
Brachyome Purple Splendor	18	35	2.5	4.5	5	5	5	5
Silene Royal Elektra	38	37	1.5	2.5	5	4	4.5	4
Red Monarch Sweet William	31	35	6.5	4	4.5	4.5	4.5	3.5
Dianthus China Doll	37	40	4.5	3.5	4	5	5	4.5
Matthiola Bicornis Evening Scented	55	50	3.5	1.5	3	4	4.5	5
Helichrysum Fine Mixed	115	70	5	4	4.5	5	5	5
Acroclinium Red Bonnie	56	40	3.5	4.5	4	4.5	5	5
Stocks Brilliant Double Purpose	50	30	4.5	4.5	3.5	3	3.5	3
Stock Ball Column Formula Mix	30	44	4	4.5	4.5	4.5	4.5	3
Mignonette finest mixed	38	50	3	4	5	4.5	4	4
Heliotrope Lemoine Strain	42	55	15	4.5	5	5	5	5

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)				
	Height	Width	Flower Size	July 2	July 23	Aug.8	Aug.23	Sept.4
Gaillardia Double Lorenziana	65	90	6.5	3.5	3.5	3	3.5	4
Craspedia Drumstick	40	43	4.5	4	4	4	4	4
Salpiglossis Bolero Hybrids Mixed	85	90	8	3.5	5	5	5	5
Xeranthemum Immortal Mixture	50	54	3.5	3	4.5	5	5	2
Gynoglossum Firmament	65	85	2	4	5	5	4.5	2
Helichrysum Ball Mixture (strawflower)	90	55	4.5	4	5	4.5	5	5
Statice Sunburst Rose	60	45	6.5	5	5	5	5	4.5
Statice Fortress Mixed	75	60	8	5	5	5	5	4.5
Statice Excellent Mixture	60	39	6.5	4.5	5	5	5	4.5
Trachelium Umbrella Purple	58	32	11.5	3.5	4.5	4	4.5	5
Larkspur King Sized Mix	47	15	3	4	4.5	4.5	0	0
Larkspur Giant Emerald Mix	93	21	3.5	2	4	4.5	0	0
Larkspur Sunburst Carmine	61	27	3.5	2.5	4	4.5	2	1
Statice Mixed	70	74	6.5	4.5	5	5	5	4

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)				
	Height	Width	Flower Size	July 02	July 23	Aug. 08	Aug.23	Sept. 4
Centaurea Imperalis Finest Mixed	65	-	5.5	4	4	4	3	3.5
Nigella Mulberry English Court (Love in a Mist)	38	30	2	4	4	3	5	1
Aster Contraster Mixed	48	28	6.5	3	3.5	5	4	5
Aster Unicum Mixed	69	42	-	3.5	4.5	4.5	5	4.5
Aster Prinette	70	43	10	4	4.5	5	5	5
Aster Matador White	70	42	5.5	4	4	5	5	5
Aster Matsumoto Mixture	72	30	5.5	4	4.5	5	5	5
Aster Matador Fiery Red	82	31	8.5	4.5	4.5	5	5	5
Aster Ball Florist Mix	80	62	10.5	4.5	4.5	5	5	5
Aster Double Rainbow Mix	93	39	9	4.5	4.5	5	5	5
Aster Giant Princess Mix	87	64	6	4.5	4.5	5	5	5
Aster St. Tropez	66	44	8	5	4.5	5	5	5
Ageratum Golden Ageratum	39	55	3.5	4	4.5	4	3	2

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)					
	Height	Width	Flower Size	July 2	July 23	Aug.8	Aug.23	Sept.4	
Ageratum Blue Mink	35	43	10	4.5	4.5	4.5	4.5	5	
Ageratum Blue Horizon	65	55	7	4	4	5	5	5	5
Amaranthus Caudatus	134	60	-	4.5	5	5	4	3.5	
Amaranthus Early Splendor	146	57	-	5	5	5	5	4	
Amaranthus Tricolor	148	40	-	5	5	5	5	5	
Amaranthus Flaming Fountain	150	52	20-40	5	5	4.5	4	2.5	
Snapdragon Tampice	82	50	8.5	4	4.5	5	4.5	4	4
Snapdragon Potomac White	70	37	8	4	4.5	5	5	5	
Snapdragon Potomac Red	78	55	7	4	4.5	5	5	5	
Snapdragon Winchester	82	72	7	4	5	5	5	5	
Hybrid Snapdragon Rocket Blend	76	35	7	4	5	5	5	5	
Dediscus D. Coerulea	53	64	5	2.5	4.5	5	2	1	
Centaurea frosted Queen Mix	65	51	3.5	2	4	5	4	2	
Celosia Cristata Chief Mix	125	90	10	4.5	4.5	5	4.5	4.5	

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)				
	Height	Width	Flower Size	July 8	July 23	Aug. 8	Aug.23	Sept.4
Cacalia Harvest Mix	100	110	4.5	4	5	4.5	4	4
Gomphrena Woodcreek Red	72	65	2.5	4	4.5	4	5	5
Viscaria Blue Angel	43	46	2.5	3	5	5	2	0
Clarkia Mixed	24	59	2.5	1	4.5	3	0	0
Tithonia Goldfinger	170	110	8.5	4	5	5	5	4.5
Cirsium Early Beauty Mixed	61	42	4	2.5	4	5	4	3
Godetia Grace Mix	31	25	5	2.5	5	5	3	2
Salvia Tricolor Mix	80	69	4.5	3	2	3.5	5	4
Salvia farinacea White Bedder	66	79	4	3	3.5	5	5	5
Scabiosa Imperial Giants mix	92	30	6	3.5	4	4	4	3.5
Centaurea Imperial Mixed	77	57	6	2	3.5	4	3	3
Centaurea Imperalis finest mixed	60	75	6	2	3.5	4.5	3	3
Solidago Golden Baby	59	32	5	4.5	4.5	5	4.5	3
Anami Majus Snowflake	-	-	-	2	2	0	0	0

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)				
	Height	Width	Flower Size	July 2	July 23	Aug.8	Aug.23	Sept.4
Cosmos Early Sensation Mixed	142	110	10	5	5	4	4	3
Cosmos Daydream	176	107	9.5	5	5	4.5	4	3.5
Cosmos Picotee	165	116	9	5	5	4	4	4
Cosmos Imperial Pink	156	105	7	5	5	4.5	4	3
Cosmos Seashells Mixed	147	110	7	5	5	4.5	4	3
Schizanthus Hit parade mixed	41	22	2.5	1	3	1	0	0
Acroclinium double mixed	63	58	3.5	3.5	4	5	4	2
Centaurea Finest Mixed	72	54	3	1	4	4.5	4	4
Ursinia Anothdids	45	58	4	4.5	5	5	5	2
Candytuft Hyacinth Floral Giant White	28	13	5	2	4.5	4.5	2	1
Safflower lasting orange	-	-	-	2	0	0	0	0
Zinnia Scarlet Spendor	85	110	12	3	4.5	4	4.5	4
Hybrid Zinnia Giant Blend Zenith	75	102	12.5	3	3.5	5	5	5

PLANT NAME	PLANT MEASUREMENTS 2 Mo. after Planting			BI-WEEKLY GARDEN ASSESSMENT (RATED 0-5)				
	Height	Width	Flower Size	June 21 Sept.4	July 8	July 23	Aug.8	Aug.23
Hybrid Zinnia Mixture Sunshine	87	98	13.5	2	2	4	4	5
Achillea Summer Pastels Mix	39	40	7.5	5	2	4	5	5
Gypsophila Elegans Market Convent Garden	32	33	1.5	1	1	0	0	0
Gypsophila Snow fountain	45	38	2	2.5	2	1	1	2
Gypsophila Elegans Alba Grandiflora	26	27	1.5	2.5	0	0	0	0
Gypsophila Elegans Grandiflora	46	54	1.5	3.5	3.5	2	0	1
Iberis Mount Hood	23	14	3.5	3	2	2	3	3.5
Doronicum Caucasicum Mix	9	19	-	2.5	2	1	3	3
Calendula Pacific Beauty	62	74	6.5	4	3	4	3	1
Trachelium Umbrella White	35	26	10	1	1.5	2	4	4

FIELD FORCING OF TULIP AND DAFFODIL FOR EARLY MARKET PRODUCTION

Andrew Currie, Gerry Chevrier, Julie Baker

ABSTRACT: A preliminary evaluation of the feasibility of field forcing bulbs indicated that tulip and daffodil cultivars produced earlier crops under plastic covers. Crops under clear plastic were the earliest to initial and 50% harvest. Control (uncovered) tulip and daffodil plots produced more marketable stems than those covered by clear plastic although no significant differences were noted for yield among treatments. Air temperatures under painted and opaque tunnels was notably lower (by 2 to 12 C respectively) than those under clear plastic. Tulip flower yields under shaded plastic were as high if not greater than yields under clear plastic. The highest yielding tulip cultivar was Spring Song due to its ability to produce double blooms. Daffodil yields were not significantly different across treatments and cultivars.

FORÇAGE AU CHAMP DES TULIPES ET JONQUILLES AUX FINS DE PRODUCTION HÂTIVE POUR LE MARCHÉ

Andrew Currie, Gerry Chevrier, Julie Baker

RÉSUMÉ : Une étude préliminaire de la faisabilité du forçage au champ des bulbes nous a permis de constater que les cultivars de tulipes et de jonquilles produisaient des récoltes plus hâtives s'ils étaient recouverts de plastique. Les cultivars sous un plastique transparent étaient les premiers à être récoltés et à atteindre un taux de récolte de 50 %. Les parcelles de tulipes et jonquilles témoins (non paillées) ont produit des tiges de meilleure qualité pour le marché que celles cultivées sous le plastique transparent. Toutefois, on n'a constaté aucune différence importante dans les rendements. La température de l'air sous le plastique peint ou opaque était considérablement plus basse (de 2 à 12 degrés respectivement) que celle sous le plastique transparent. Le rendement des tulipes sous le plastique peint était aussi élevé sinon plus élevé que celui des tulipes sous le plastique transparent. Le meilleur rendement de la tulipe Spring Song est imputable à sa capacité de produire des fleurs doubles. On n'a constaté aucun écart marqué dans les rendements des jonquilles selon les cultivars ou les traitements.

INTRODUCTION: Early season production of horticultural crops is desirable since product demand and price are at their best at that time. Recent innovations have helped greatly to realize this potential for early markets in a number of sectors. In the vegetable industry, the use of plastic tunnels and mulches has resulted in increased yields and quality (1,3).

This project will evaluate the profitability and feasibility of field forcing tulip (Tulipa) and daffodil (Narcissus spp.) as early season cut flower crops. Traditionally in N.B. these crops are produced in greenhouses which is fairly labour and energy intensive. As well specific handling, chilling and forcing facilities are required. In this project the specific climatic requirements for bulb chilling will be provided over winter in the field. With the use of plastic tunnelling in the spring to modify the bulb's environment, dormancy may be broken after the required growth period, thereby forcing flowers for early production.

MATERIALS AND METHODS: This trial was conducted at the N.B. Agriculture/Horticulture Centre at Hoyt. Bed planting of the tulip and daffodil crop took place on October 23 1990. Bulbs were planted at a depth of 8 inches (20 cm) and spaced 2 inches (6 cm) apart.

Treatments were applied to the tulip plot using a completely randomized design with 4 replicates. Tulip cultivars included Apeldoorn Elite, Spring Song and Golden Apeldoorn. The same treatments were applied to the daffodil plots (cvs. Flower Record, King Alfred, Geranium and Yellow Cheerfulness) using a completely randomized design with three replicates. The treatments were as follows:

T1 = Control (no plastic cover)
T2 = Clear plastic cover in early spring and left on until harvest was complete.
T3 = Clear plastic sprayed with white paint (Summer Cloud) at crop emergence.
T4 = Clear plastic sprayed with Summer Cloud at stem elongation.
T5 = Opaque plastic

The painted covers and opaque plastics were used to observe any effect of etiolation that may result from flower stem elongation under low light conditions.

On April 10, the cover treatments were applied to the tulip and daffodil plots. From April 28 - May 3 all T3 plots were sprayed with an application of Summer Cloud (ratio of 1:12). This treatment was applied when 30% of the bulbs had emerged. On May 7 and 8 all T4 plots were sprayed with Summer Cloud (ratio of 1:12). This treatment was applied when 30% of the flower stems had begun to elongate. On Friday May 10, coincidental to first tulip harvest, the temperatures under each treatment were recorded for comparison:

T1 Control (air temperature) = 18 C
T2 Clear plastic = 38 C
T3 Paint at crop emergence = 36 C
T4 Paint at stem elongation = 36 C
T5 Opaque plastic = 26 C

The harvest period was from May 9 to June 3. The tulips were cut when the entire bud was coloured but tight, for a high quality flower with maximum vase-life. Daffodils were cut at the goose-neck stage of development, when the flower head angles away from the stem (2). The cut flowers were then placed in separate containers of water and held in cold storage.

RESULTS AND DISCUSSION: One problem affecting the accuracy of this trial stems from the fact that each plot contained a mixture of cultivars. This made it difficult in the timing of paint treatments, harvest and removal of covers since the cultivars emerged and flowered at different times.

TABLE 1 - Number of marketable tulips produced under various cover treatments.

	T1	T2	T3	T4	T5
A	*69.5 **abc	35.0 c	70.75 ab	59.0 abc	69.2 abc
B	87.2 a	83.7 ab	81.0 ab	82.5 ab	79.7 ab
C	52.7 abc	50.7 bc	59.2 abc	57.7 abc	57.2 abc

Cultivars - A = Apeldoorn Elite B = Spring Song C = Golden Apeldoorn

*Values are based on the mean of 4 replicates.
**Duncans Multiple Range Test at .05 level.
Numbers followed by the same letters are not significantly different.

T1 = Control
T2 = Clear plastic
T3 = Clear plastic with white paint applied at crop emergence
T4 = Clear plastic with white paint applied as stem elongates
T5 = Opaque plastic

Yield data for marketable tulip flower number (Table 1) indicates there was a significant difference between cultivars across the five treatments. Spring Song produced the highest yields among cultivars and yields were consistently higher across all treatments. This is attributed to the high number of double blooms, an advantage over the other cultivars tested since flower stalks produced on double flowering bulbs were of good length for cut flowers. This could result in increased return for the producer. Spring Song did not appear to benefit from any type of plot cover with the highest number of flowers being produced in the control plots.Clear plastic tunnels produced the least number of flowers in Apeldoorn Elite and Golden Apeldoorn plots. These cultivars may have been adversely affected by high temperatures observed under the covers (38 C). When compared to control plots, the shaded treatments increased flower number of Golden Apeldoorn and not for Apeldoorn Elite, indicating the different response among cultivars.

Statistical analysis was not performed on daffodil flower numbers. Adequate replication was not possible due to a shortage of bulbs and disease problems that were encountered when the shipment arrived at planting time. Yield data (expressed as a total of all cultivars) is presented in Table 2.

Harvest data (Tables 2-4) indicates that all plots under plastic cover were harvested earlier than the control. Treatments T1(clear plastic), T2(paint at emergence) and T3(paint at elongation) were harvested first followed by T5(opaque) and T1(control).

Daffodils - Flower number (Table 2) was relatively consistent with the exception of T4 (painted at stem elongation) which produced the fewest marketable stems. Overall clear plastic was the best treatment in terms of initial harvest (May 9) and time to 50% harvest (May 19). The slowest treatment was Control (T1) which was initially harvested May 14. Time to 50% was May 25.

The length of the harvest season was slightly affected by covering treatments. Control (T1) had the shortest and most concentrated harvest period (20 days), Opaque (T5) had a slightly longer harvest period (23 days), while the remaining treatments were harvested over 25 days. The higher temperatures under these covers caused the early emergence of a few bulbs prior to the emergence of the majority in the plot.

Tulips - Crop earliness (Table 3) was noted across treatments and among cultivars. With the exception of Golden Apeldoorn, time to 50% harvest was hastened by at least 4 days when some type of plastic cover was used. The earliest cultivar was Golden Apeldoorn which was initially harvested in T3 plots (painted at emergence) on May 9 (Table 4) and reached 50% harvest May 11. Overall, T3 (paint at crop emergence) was the earliest treatment to reach time to 50 % harvest. Control (T1) was the latest treatment overall to reach time to 50% harvest. Regardless of cultivar, Opaque (T5) and Control (T1) were the latest treatments to reach initial harvest (Table 4) on May 12 and May 13 respectively.

CONCLUSIONS: Tulip and daffodils can be forced onto the market earlier by applying plastic covers. High air temperatures under clear plastic tunnels help to hasten emergence and time to 50% harvest, however total flower number at the completion of harvest was often lower than control treatments or other plastic cover treatments. In most cases, time to initial and 50% harvest was only slightly delayed when shaded treatments were compared to clear plastic. Response to covering treatment varied with each cultivar tested.

This trial was not effective at screening cultivars that could produce an early market bulb crop since cultivars were mixed in each plot making it difficult to clearly discern the effect of each covering treatment. For the same reasons, the effect of shading on stem etiolation could not be observed since the rate of emergence and general development among cultivars under each treatment was varied. The 1992 trial beds were planted to one cultivar per plot and should provide a clearer indication of promising cultivar/treatment combinations that could be used for early field forcing.

ACKNOWLEDGEMENTS: The authors wish to acknowledge the support of the staff at the Hoyt Research Station, NBDA and Andrew Mazerolle(Summer student) during the course of this trial. This project was funded by the Canada/New Brunswick Cooperation Agreement on Agri-Food Development. Project # B8021-1.

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TABLE 2 - Initial, 50% and final harvest for daffodils, according to treatment.

TREATMENT	INITIAL HARVEST	50 % HARVEST	FINAL HARVEST	NUMBER HARVESTED
T1 Control	May 14[1]	May 25	June 3	637
T2 Clear Plastic	May 9	May 19	June 3	628
T3 Paint at emergence	May 9	May 21	June 3	662
T4 Paint at stem elongation	May 9	May 21	June 3	440
T5 Opaque	May 11	May 24	June 3	634

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[1] These dates were averaged across three replicates.

Table 3 - 50% harvest dates for three tulip cultivars across five treatments.

TREATMENT	50% HARVEST DATES BY CULTIVAR[1]			NUMBER HARVESTED (CULTIVAR)
	A	B	C	
T1 Control	May 17[2]	May 21	May 17	A = 1231 B = 1491 C = 1205
Clear plastic	May 12	May 17	May 12	
T3 Paint at crop emergence	May 12	May 14	May 11	
T4 Paint at stem elongation	May 13	May 17	May 12	
T5 Opaque plastic	May 13	May 17	May 17	

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[1] A = Apeldoorn Elite B = Spring Song C = Golden Apeldoorn

[2] These dates were based on the average of four replicates

TABLE 4: Initial, final and length of harvest season of tulips according to covering treatment.

TREATMENT	INITIAL HARVEST	FINAL HARVEST	LENGTH OF HARVEST (DAYS)	NUMBER HARVESTED
T1 control	May 13[1]	June 3	22	769
T2 clear plastic	May 9	May 30	22	687
T3 paint at emergence	May 9	May 30	22	804
T4 paint at elongation	May 9	May 27	19	800
T5 opaque plastic	May 12	May 30	19	839

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[1] These dates were averaged across three replicates.

CEREAL CROPS & FORAGES/CÉRÉALES & FOURRAGES

SOYBEAN CULTIVAR EVALUATION
SUSSEX 1991

W.J. Brown & A.O.M. Smith

ABSTRACT: Ten cultivars of soybean were planted at Penobsquis, near Sussex on May 9 1991. Seeding rate of the plots was 80 seeds per sq. metre. Cultivars were rated on agronomic data as well as physiological maturity. The early seeding date resulted in low moisture levels in all cultivars at harvest. Some of the earlier cultivars could have been harvested in mid September. Yields were very encouraging with the top cultivar Maple Glenn producing 4.21 T/ha.

ÉVALUATION DES CULTIVARS DE FÈVES SOJA
SUSSEX 1991

W.J. Brown et A.O.M. Smith

RÉSUMÉ : On a planté le 9 mai 1991 dix cultivars de fèves Soja à Penobsquis, près de Sussex. On a ensemencé les parcelles à un taux de 80 graines par mètre carré. Puis, on a évalué les propriétés agronomiques et la maturité physiologique des cultivars. La plantation plus tôt que d'habitude a permis d'obtenir à la récolte un taux d'humidité moindre dans tous les cultivars. On aurait pu récolter à la mi-septembre certains des premiers cultivars plantés. On a obtenu des rendements très encourageants. Le meilleur cultivar, Maple Glenn, a produit 4,21 t/ha.

INTRODUCTION: Advances have been made in the breeding of soybean varieties that have reduced the number of heat units required to reach maturity. To add to this advance there has been a marked increase in corn heat units in a number of areas in the province in the past several years. When both of these happenings are taken together, it appears that soybean production may have some potential in areas of the province that receive adequate heat units within the thirty year norm.

MATERIALS AND METHODS: Ten soybean cultivars were planted in a 4 replicated RCB at Penobsquis on May 9, 1991. The soil was a sandy clay loam with phosphate at 700 kg/ha (very high) potassium at 400 kg/ha (very high) and a pH of 6.0. The plot was fertilized with 250 kg/ha of 5-20-20 at planting. Seeding rate was 80 seed per square meter. The site received 4.95 L/ha of Round-up the previous fall and 3.0 kg/ha of Lorox in the spring as a preemerge treatment. The soybeans were harvested using a plot combine on October 9, 1991.

RESULTS AND DISCUSSION: Soybean cultivars all emerged at relatively the same time however the germination rate was low due to 2nd year seed being used in the plots. Plant populations appeared to be adequate ranging from 34 to 48 plants per meter square. The plant population did not appear to greatly effect the yield of the soybeans with in these ranges (Table 1). Maple Glenn, the cultivar with the highest yield had one of the lowest plant populations.

A weather station was set up in the plot area so data on heat units and growing degree days was available. All soybean cultivars had emerged by May 26th. At that time approximately 200 CHU's (Corn Heat Units) or 100 growing degree days had accumulated since seeding. Although the plot site was hit by frost on May 18 and 22 there was no apparent damage to the soybeans.

Physiological maturity was taken at the time when the soybean leaves turned yellow and began to drop. The days to maturity ranged from 111 to 122 days (Table 2). The corresponding corn heat units were 2070 to 2250. At harvest time 2630 corn heat units had accumulated which may be the main reason for the very low moisture levels in all the soybean cultivars at harvest. The moisture levels reported here should be used for rating the soybean cultivars only as they were in the dryer 12 hours before the initial weights were taken. Therefore the moisture reported here is somewhat lower than the harvest moisture. We assume that all cultivars were drying at the same rate. Some of the earlier maturing cultivars could have been harvested in mid September. The earliest cultivars were in the plot approximately 40 days after they reached maturity.

CONCLUSIONS: All soybean varieties reached adequate levels of maturity at the harvest date and produced good yields. The soybean cultivars tested have good potential for production in New Brunswick. The top cultivar produced 4.21 T/ha and the mean for the plot was 3.65 T/ha. From data gathered on the 1991 plots, early planting dates have a good potential for increasing yield and dry matter content in soybeans.

ACKNOWLEDGEMENTS: Thanks is expressed to Stephen Moffett for supplying and preparing the land for these trials. Also to Wayne McLeod for the use of his machinery.

TABLE 1: Yield & Agronomic Data on Soybean Cultivars Tested at Sussex in 1991.

Cultivars	**Yield T/ha* 14.0 % M.**	**Moist %**	**Plant /sqm**	**100 Seed wt gm.**	**Protein %**
Maple Glenn	4.21 a	10.54	35.00	18.73	37.44
KG 30	4.07 a	9.56	40.00	13.78	37.47
AC Bravor	3.98 a	9.90	36.75	17.36	38.08
Apache	3.95 ab	11.32	48.25	16.43	40.33
Bicentennial	3.70 bc	12.50	36.00	21.20	38.22
Baron	3.56 cd	11.35	41.25	16.40	36.49
Maple Arrow	3.52 cd	10.34	35.25	16.89	37.67
KG 20	3.37 de	12.08	39.25	17.48	36.61
OT 89-16	3.13 ef	10.01	37.50	15.91	42.71
Maple Amber	3.07 f	9.21	34.25	16.89	37.55
L.S.D.(.05)	0.27	1.72	7.60	0.71	1.13
C.V. (%)	5.02	11.12	13.66	2.85	2.04

* Values followed by the same letter are not significantly different.

TABLE 2: Physiological Data of Soybean Cultivars Tested at Sussex in 1991.

Cultivars	**Days to Maturity**	**Growing Degree Days**	**Corn Heat Units**
Baron	111	1270	2070
KG 20	112	1290	2100
Maple Amber	112	1290	2100
Maple Glenn	116	1320	2160
OT 89-16	116	1320	2160
Maple Arrow	117	1330	2180
Bicentennial	117	1330	2180
KG 30	118	1340	2200
AC Bravor	121	1370	2250
Apache	122	1370	2250

CORN GROWTH ANALYSIS
SUSSEX 1991

W.J. Brown and A.O.M. Smith

ABSTRACT: The corn hybrid N0565 was sampled for trials in Penobsquis on a 14 day period beginning on June 20th and completed on October 24th. Plant material was separated into leaf, stalk, tiller, husk, cob, and grain for analysis. Dry matter accumulation as well as nitrogen, phosphate, potassium, calcium, and magnesium were followed in each of the plant components. The maximum dry matter yield on the whole plant occurred on September 12th while the maximum grain yield occurred on September 29th. The maximum uptake of the N, P, and K was 208, 34, and 176 kg/ha resp.

ANALYSE DE LA CROISSANCE DU MAIS
SUSSEX 1991

W.J. Brown et A.O.M. Smith

RÉSUMÉ : Tous les quatorze jours entre le 20 juin et le 24 octobre, on a prélevé à Penobsquis des échantillons du maïs hybride N0565. Aux fins d'analyse, on a séparé les différentes parties de la plante : la feuille, la tige, la talle, le spathe, le rafle et le grain. On a mesuré pour chaque partie l'accumulation de matière sèche ainsi que d'azote, de phosphate, de potassium, de calcium et de magnésium. Le rendement maximal en matière sèche pour toute la plante a été obtenu le 12 septembre alors que le rendement maximal en grains a été obtenu le 29 septembre. Les résultats les plus élevés pour N, P et K étaient respectivement de 208, 34 et 176 kg/ha.

INTRODUCTION: The majority of corn acreage in New Brunswick is grown in rotation with forages on livestock farms. When looking at the fertility supplied by the previous crop it is important to know first what nutrient levels are required by the corn. At present the best information that is available is from areas where longer season hybrids are grown. The purpose of this trail was to determine where the nutrient uptake occurred in the growing season as well as how the dry matter is accumulated in the plant.

MATERIALS AND METHODS: Four rows of corn were planted in a replicated plot on soil with high to very high fertility. An application of 10-40-5 was banded at the rate of 250 kg/Ha at planting. Weed control was Round-up applied in the fall at 4.95 l/ha and Atrazine applied preemerge at 2.25 kg/ha. Locations to be sampled were identified in each rep. with 3 of 5 plants taken for analysis. The analysis began on June 20th and was terminated on October 24th.

The identified corn plants were harvested every 14 days for data collection. The plant material was separated into leaf, stalk, tiller, husk, cob, and grain as well as recording internode length. The material was weighed wet and then dried. Standard tissue analysis was then done on each component.

RESULTS AND DISCUSSION: Soil samples on the trial site indicated high fertility with good organic matter present in the top 30 cm (Table 1). Twenty-five kg/ha of nitrogen was banded at seeding with the organic matter in the soil completing the supply of nitrogen taken up by the corn. Soil samples were taken at depths of 0-15, 15-30, and 30-45 cm at 14 day intervals following planting to be analyzed for NH4-N and NO3-N. The increase in nitrogen in the plant at each test period was compared to the NO3-N in the 0-15 cm depth of the soil (Fig. 4). At this level the NO3-N began the season at 18.55 mg/kg and peaked at 68.9 mg/kg on August 1st before declining to 14.85 mg/kg on the final test on October 24th.
The accumulation of dry matter could be divided into three time periods of 55 days. In the first period dry matter accumulation was 0.546 T/ha, in the second period the dry matter increased to 10.15 T/ha and in the third period it reached 14.25 T/ha (Fig. 1). Nutrient uptake peaked at the beginning of the third period (125 days) with potassium being later than nitrogen (Fig. 2 & 3). The maximum uptake of the major elements were 208 kg of N, 34 kg of P, and 176 kg/ha of K. The internode length increased dramatically during the second period which corresponded to the increase in dry matter (Table 2).

CONCLUSIONS: In this trial the maximum dry matter yield of 14.25 T/ha was achieved on September 12. The grain yield reached its maximum 14 days later on September 26. The plant dry down increased at a faster rate after the grain yield became constant. Maximum nutrient uptake was achieved between September 12th and 26th with 208 kg of nitrogen, 34 kg of phosphate, and 176 kg of potash per hectare.

ACKNOWLEDGEMENTS: Thanks is expressed to Stephen Moffett for supplying and preparing the land for these trials. Also to Wayne McLeod for the use of his machinery. Appreciation is also expressed to Kimberly Marr (summer student), Jennifer Eckstein, as well as the Laboratory staff for the prompt handling of the corn analysis.

TABLE 1: Soil Analysis at Planting

Depth cm	Organic Matter	pH	Phosphate kg/ha	Potash kg/ha	Calcium kg/ha	Magnesium kg/ha
0-15	4.9	6.1	676 vh	268 h	4007 vh	231 h
15-30	3.9	6.3	493 vh	382 h	3468 vh	244 h
30-45	2.0	6.4	208 h	266 h	2858 h	143 h

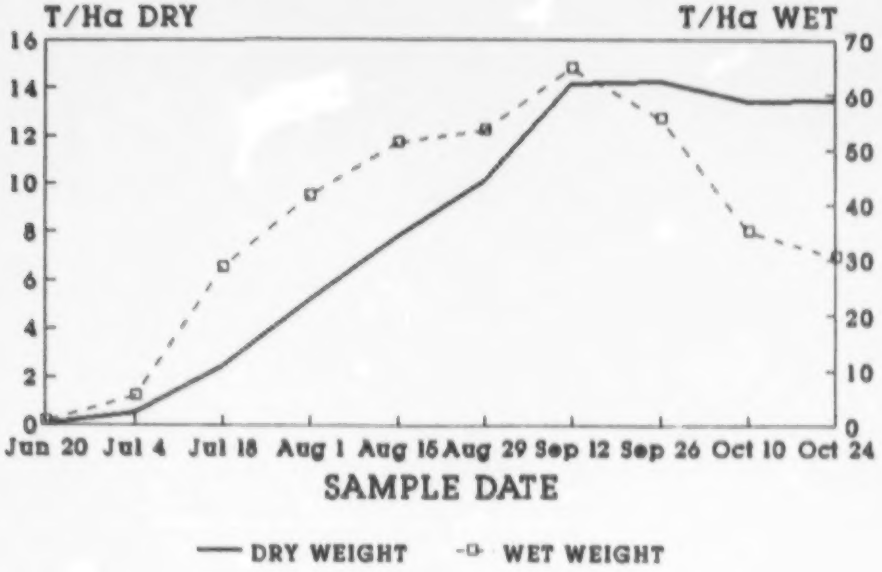
Soil Analysis at Harvest

Depth cm	Organic Matter	pH	Phosphate kg/ha	Potash kg/ha	Calcium kg/ha	Magnesium kg/ha
0-15	4.3	6.0	637 vh	229 h	3195 vh	222 h
15-30	2.5	6.0	471 vh	165 h	2559 h	156 m
30-45	1.5	6.0	241 h	126 h	1880 m	89 l

* l - low
m - medium
h - high
vh - very high

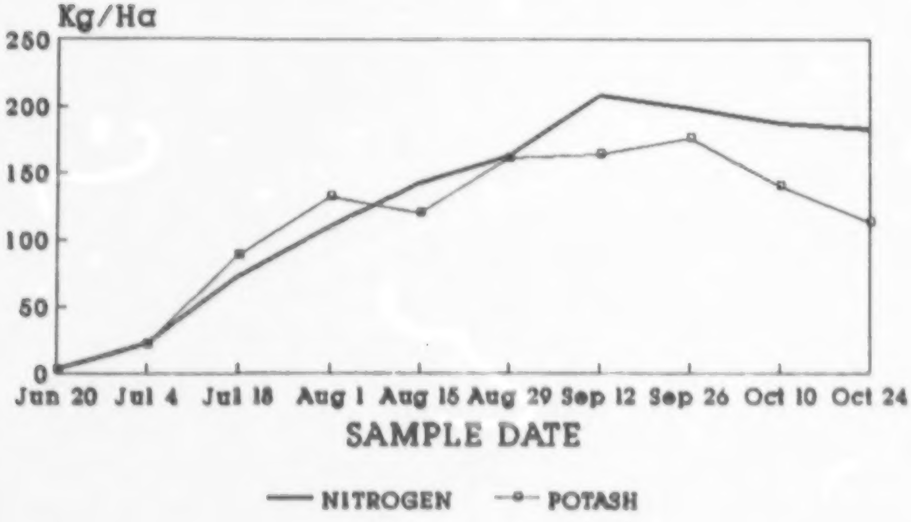
TABLE 2: Internode Length (cm)

Internode	July 18	Aug 1	Aug 15	Aug 29	Sept 12	Sept 29	Oct 10	Oct 24
1	2.7	11.2	7.8	6.9	7.2	6.7	6.8	6.4
2	2.6	14.1	12.2	11.2	13.6	12.4	11.8	11.1
3		18.8	17.0	16.5	16.8	18.0	16.1	16.2
4		8.1	19.3	20.0	18.4	19.7	18.6	19.2
5			18.3	20.4	19.1	18.5	19.3	17.8
6			13.9	19.0	18.0	17.2	17.9	17.0
7			6.5	15.7	17.7	17.2	17.3	16.4
8				3.0	17.1	16.9	14.4	16.8
9					12.5	16.9	13.5	16.8
10					9.4	17.2	19.2	11.9
11					1.3	4.5	3.7	5.9
12					1.3	1.5		3.8
13					1.3			1.3



DRY MATTER ACCUMULATION

FIG. 1



NITROGEN and POTASH UPTAKE

FIG. 2

PHOSPHATE - CALCIUM - MAGNESIUM UPTAKE

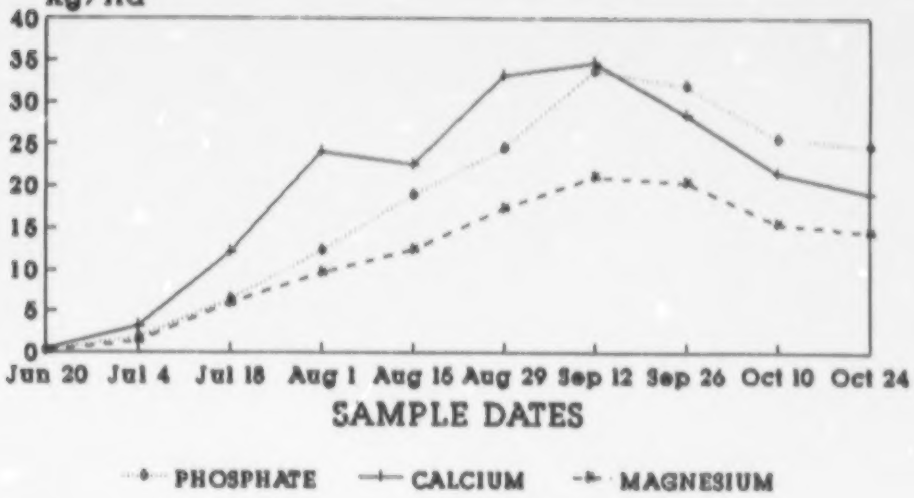


FIG. 3

SOIL and PLANT N. LEVELS

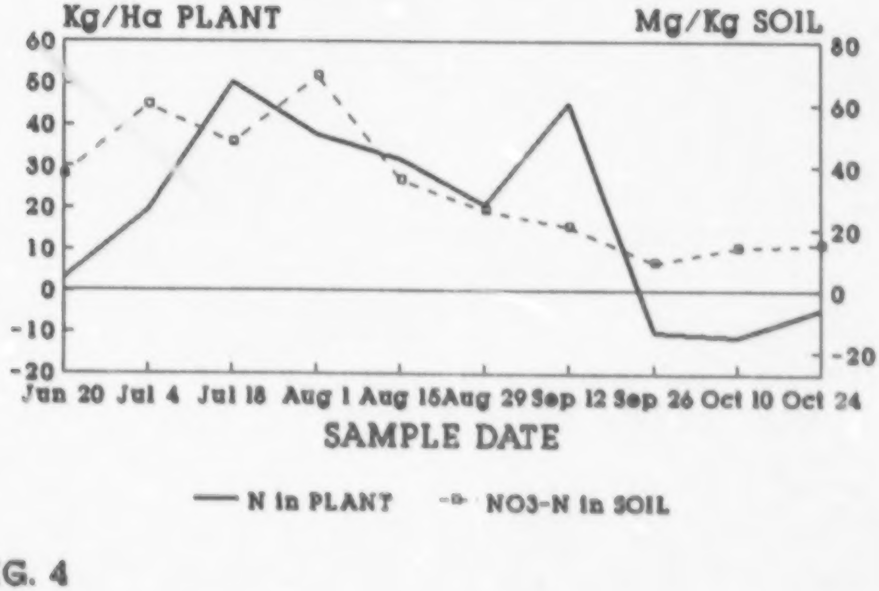


FIG. 4

ATLANTIC CORN HYBRID EVALUATION
SUSSEX 1991

W.J. Brown and A.O.M. Smith

ABSTRACT: In 1991 a grain corn hybrid evaluation trial was established in Sussex along with the silage corn hybrid evaluation trial. Data from these trials are used to assist in establishing the Atlantic Corn Hybrid Recommendations published in publication 140. Because of the warm fall, late season hybrids in the corn silage trial had higher whole plant dry matter accumulations than normal. This may give a false impression on the maturity of the late season hybrids. This was not evident in the grain corn trial however as the moisture levels in the standards tended to be at similar levels as reported in publication 140 for 1991. Grain yields were very good with Pioneer 3979 having the top yield of 8.92 tonne/hectare at 15.5% moisture.

ÉVALUATION DU MAIS HYBRIDE DE L'ATLANTIQUE
SUSSEX 1991

W.J. Brown et A.O.M. Smith

RÉSUMÉ : En 1991, on a effectué à Sussex des essais aux fins d'évaluation du mais-grain hybride et du mais-ensilage hybride. Les résultats de ces essais servent à la formulation des recommendations sur le mais hybride de l'Atlantique figurant dans la publication 140. Un automne chaud a entraîné une plus forte accumulation que la normale de matière sèche dans tout le plant de mais-grain. Un tel résultat peut induire en erreur lorsqu'il s'agit de déterminer la maturité des hybrides à la fin de la saison. Toutefois, cela n'était pas évident dans les essais du mais-grain, car les taux d'humidité dans les plants normaux tendaient à être analogues à ceux parus dans la publication 140 pour 1991. Les rendements en grains ont été très bons. La marque Pioneer a fourni le meilleur rendement, soit 8,92 t/ha avec un taux d'humidité de 15,5 %.

INTRODUCTION: In 1991 a grain corn hybrid evaluation trial was established in Sussex along with the silage corn hybrid evaluation trial. Data from these trials are used to assist in the supporting of hybrids to the Atlantic Corn Hybrid Recommendations, publication 140. The addition of grain corn to the trials will assist in establishing a relationship to the recommended hybrids in southern New Brunswick.

MATERIALS AND METHODS: The corn trials were planted at Penobsquis on May 9th, 1991. The soil fertility was high with phosphate at 700 kg/ha and potassium at 400 kg/ha and a pH of 6.1. Two-hundred and fifty kg/ha of 10-40-05 was banded at seeding and 520 kg/ha 20-0-25 was broadcast prior to seeding. Weed control was 4.95 l/ha of Round-up in the fall of 1990 and 2.25 kg/ha of Atrazine (90w) preemerge. Corn was seeded at 60 seeds per 7.6 meter row and thinned to 33 seeds when the corn was in the 5 leaf stage (June 17). The silage corn was harvested on September 24 and the grain corn was harvested on October 17, 1991.

RESULTS AND DISCUSSION: The emergence rates of some of the hybrids were low in 1991. There were two apparent reasons for this. Several of the standards were old seed which had lower vigour than new seed. Also the plot site experienced two days of low temperatures which resulted in frost. Because of early growth the corn hybrids exhibited minimal effect from the drought that occurred later in the summer.

A temperature recorder was set up at the plot site to record maximum - minimum temperatures. The site experienced lower corn heat units than the official recording station in Sussex. The silage trial was harvested on September 24 and 2440 CHU'S had accumulated at that time. The grain corn plot was harvested on October 17 and had accumulated 2690 CHU'S. The fall warm weather experienced this fall allowed later maturing hybrids to equal and sometimes exceed earlier maturing hybrids in dry matter accumulation.

Silage Corn trial (Table 1) shows how the later maturing hybrids had better dry matter than the earlier maturing hybrids. In the standards Bishop 30-30 and Pioneer 3957 are both late maturing hybrids but were two of the top three standards in dry matter. Dry matter levels did not show much spread with less than 4 percentage points from the highest to lowest.

Grain Corn trials (Table 2) had reasonable levels of moisture in the grain for storage as high moisture grain corn. Grain yields were exceptional for most hybrids with most having a performance index of 100 or better. Some of the late maturing hybrids had lower moisture levels than earlier maturing hybrids. The seed of both K610 and Co-op 2325 were from an old supply which resulted in very poor emergence levels.

The performance index is an indication of how each hybrid compared to the average of the standard hybrids, those hybrids followed by a + (late standard) or * (early standard). Because of the higher dry matter on the late standards (+) the performance index may favour later hybrids in the 1991 trials.

CONCLUSIONS: In looking at the dry matters of the later maturing corn hybrids, my recommendation to producers would be to proceed slowly in the use of these hybrids. Higher corn heat units in most regions have allowed better maturity on the late maturing corn hybrids. It is my feeling that we should look at the advances being made it good yielding, early maturing hybrids for advances in corn production in New Brunswick.

TABLE 1: Silage Corn Hybrids Tested in the Regional Hybrid Evaluation Trial at Sussex in 1991

Hybrid Name	Yield (T/ha)	% DM	Stock Break %	Emerg. %	Perform.Index
Pickseed 2444 *	11.17	27.1	5	86	96.1
Bishop 30-30 +	14.26	26.8	9	78	106.2
NL 3195(Thom) .	12.27	26.6	2	81	100.6
DK-291(Dekalb).	10.31	26.4	8	81	84.5
Co-op 6312 .	14.69	25.6	3	81	101.1
3957(Pioneer) +	12.86	25.3	9	92	100.0
3979(Pioneer) *	13.55	25.2	2	87	99.8
3921(Pioneer) .	15.56	25.1	1	93	99.1
G-4017 (CG) .	13.42	24.9	8	80	98.3
K730 (Pride) *	11.32	24.8	6	64	92.8
G-4083 (CG) .	10.07	23.9	6	75	82.6
PX 9028 (NK) +	11.55	23.7	6	62	90.7
Grand Mean	12.63	25.4	5	80	
LSD (5%)	2.12	2.1	6	11	
C.V.	11.60	5.8	72.5	9.6	

* Early Standard
+ Late Standard

TABLE 2: Grain Corn Hybrids Tested in the Regional Hybrid Evaluation Trials at Sussex in 1991

Hybrid Name	Yield* (t/ha)	Moist. %	Stock Break %	Emerg. %	Perform. Index
166792 (Pn) .	7.30	30.9	22	92	103.1
DK-24 (Dekalb)+	7.67	31.4	12	89	108.3
3979 (Pioneer).	8.92	32.0	9	89	125.9
G-4011 (CG) .	7.29	32.9	5	89	103.0
G-4017 (CG) .	8.09	33.7	4	83	114.2
N0565 (NK) .	8.44	33.9	6	84	119.2
Pickseed 2477 .	6.73	34.2	13	91	95.1
Figaro (Pride).	7.34	34.2	10	86	103.7
Co-op 2325 .	7.52	34.6	6	53	106.2
G-4083 (CG) .	6.81	34.7	14	71	96.2
G-4012 (CG) .	7.35	34.9	11	79	103.8
3954 (Pioneer)+	7.82	35.0	9	87	110.4
Co-op 6312 *	8.20	35.1	7	85	115.7
K610 (Pride) *	5.83	35.6	5	46	82.3
DK-235(Dekalb)*	7.22	35.7	9	75	102.0
HL 2219 (Thom)+	7.47	35.9	11	71	105.5
Pickseed 2404 .	7.17	38.2	8	84	101.3
K127 (Pride) .	8.12	39.5	8	88	114.6
K131 (Pride) .	7.77	40.2	4	87	109.8
AG Co-op 6309 .	7.84	40.5	9	77	110.7
Grand Mean	7.55	35.2	9	80	
LSD (5%)	0.83	2.4	8	10	
C.V.	7.6	4.7	63.4	8.9	

* Early Standard
+ Late Standard

CORN NITROGEN STUDY
SUSSEX 1991

W.J. Brown and A.O.M. Smith

ABSTRACT: A trial was established in Penobsquis to look at nitrogen requirements of both silage and grain corn. The soil at the trial site was high in fertility and organic matter. While there was no significance in the yield of the whole plant silage in this trial there was in the grain corn. Although there was no significance in the nitrogen removed in the corn silage treatment, # 5 produced 14.27 T/ha of silage which removed 216.38 kg/ha of nitrogen.

ÉTUDE SUR LES BESOINS EN AZOTE DU MAIS
SUSSEX 1991

W.J. Brown et A.O.M. Smith

RÉSUMÉ : On a effectué à Penobsquis un essai afin de déterminer les besoins en azote du maïs-grain et du maïs-ensilage. Le sol choisi était très fertile et riche en matière organique. Les résultats étaient insignifiants pour le rendement en maïs-ensilage, mais il en a été autrement pour le maïs-grain. Bien que les résultats soient insignifiants pour l'azote consommé par la culture du maïs-ensilage, le numéro 5 a produit 14,27 t/ha de maïs-ensilage, ce qui a consommé 216,38 kg/ha d'azote.

INTRODUCTION: Corn has the distinction of being a good crop for high manure applications as it has the ability to use high levels of nitrogen longer into the growing season than cereal grains. Local producers who grow silage corn have been looking to manure as the major contributor of fertility for their crop. This trial is an attempt to answer some questions on the fertility requirements of corn and the source of these nutrients in a good cropping rotation.

MATERIALS AND METHODS: The trial was planted at Penobsquis on May 10th 1991. The soil was sampled at depths of 0-15, 15-30, and 30-45 cm prior to planting. Replicated plots of 4 rows 7.6 meters long were established using N0565 and nitrogen was applied at the rates of 50, 90, 130, 170, and 210 kg/ha. Twenty-five kg/ha was banded with the corn planter and the additional nitrogen was broadcast at planting. Roundup was applied in the fall of 1990 at the rate of 4.92 l/ha and Atrazine was applied preemerge at the rate of 2.25 kg/ha. Each of the reps. were sampled at the 3 depths on October 24th following the harvest of the grain corn. Each rep. had a row harvested as whole plant silage on September 24th and a row harvested as grain corn on October 17th.

RESULTS AND DISCUSSION: The trial was planted with a two row plate planter which gave some variation in plant population across the reps. Lower then expected germination also had an effect on the population. The reps. had final populations ranging from 45447 to 47611 plants per hectare.

The initial soil samples taken on May 9th contained higher levels of nitrogen in the soil than anticipated. In the 0-15 cm zone there was 11.05 mg/kg of NH4-N and 18.55 mg/kg of NO3-N. In following this through the growing season on a 14 day test schedule, the NO3-N peaked on August 1st at 68.90 mg/kg. Because of this level of nitrogen already in the soil, there was no significant difference in yields of whole plant silage. However there was a small yield response to nitrogen in all 5 treatments.

In the grain corn there was a significant difference in the yield between 50 and 90 kg/ha of additional nitrogen. There was no response to grain yield above 170 kg/ha of additional nitrogen.

CONCLUSIONS: The addition of nitrogen in these trials produced an increase in yields of silage at all levels but were not significant. In the grain corn there was a significant difference between treatment 1 and 2 only.

ACKNOWLEDGEMENTS: Thanks is expressed to Stephen Moffett for supplying and preparing the land for these trials. Also to Wayne McLeod for the use of his machinery.

TABLE 1: Nitrogen Removed in the Whole Plant Silage

Treatment	N applied kg/ha	NO3-N May 10 mg/kg	N in Corn kg/ha*	NO3-N Oct 24 mg/kg
1	50	18.55	194.41 a	12.75
2	90	18.55	184.27 a	14.10
3	130	18.55	189.88 a	11.28
4	170	18.55	201.59 a	15.98
5	210	18.55	216.38 a	15.06

* Values followed by the same letter are not significantly different.

TABLE 2: Yield of Whole Plant Silage & Grain Corn

Nitrogen kg/ha	Plant/ha	Silage T/ha*	Silage D.M.	Grain(15.5%) T/ha*	Grain Moist.
50	46745	12.56 a	30.09	6.30 b	31.49
90	45880	12.65 a	31.08	6.87 ab	30.87
130	47611	12.89 a	28.83	7.11 ab	30.27
170	45447	13.31 a	29.29	7.42 a	31.59
210	45447	14.27 a	33.16	7.42 a	30.67
LSD (.05)		2.87	6.12	1.06	2.72
C.V. (%)		14.20	13.03	9.79	5.69

* Values followed by the same letter are not significantly different.

BARLEY CULTIVAR EVALUATION
SUSSEX, GRAND FALLS AND BATHURST 1991

D.F. Walker, A.O.M. Smith and C. Turner

ABSTRACT: Sixteen barley cultivar/lines were planted at Sussex, Grand Falls and Bathurst and had yields ranging from 4.8 - 3.8, 4.9 - 4.3, and 2.9 - 1.8 T/ha respectively. Lodging did not occur on any cultivar/line at Sussex or Grand Falls. All cultivar/lines lodged uniformly at Bathurst. Yields were higher at Sussex and Grand Falls because of earlier planting, higher fertility, and better moisture distribution.

ÉVALUATION DES CULTIVARS D'ORGE

D.F. Walker, A.O.M. Smith et C. Turner

RÉSUMÉ : On a planté seize cultivars/lignées d'orge et obtenu des rendements de 4,8 à 3,8 t/ha à Sussex, de 4,9 à 4,3 t/ha à Grand-Sault et de 2,9 à 1,8 t/ha à Bathurst. La verse ne s'est pas manifestée à Sussex ni à Grand-Sault. Toutes les lignées et tous les cultivars se sont versés à Bathurst. Les rendements plus élevés à Sussex et à Grand-Sault sont imputables à une plantation plus tôt, à une plus grande fertilité du sol et à une meilleure distribution de l'eau.

INTRODUCTION: Cultivar evaluation and adaptation trials are a labour intensive routine component of any cereal research program. The main objective of any cultivar testing program is to (a) select the highest yielding and agronomically suitable line or cultivar for a given region and (b) to demonstrate these new cultivars or lines to the producers that will eventually grow them. The Field Crop section of the N.B. Dept. of Agriculture regards this activity as a high priority. It is only through growing the highest yielding and most agronomically suitable cultivar that farmers in N.B. can stay competitive and make a profit.

In N.B., in excess of 90% of the grain produced is used for feeding livestock and the remainder is used for seed. Of the three small grains, barley is the most widely grown followed by oats and wheat. The bulk of the barley acreage in N.B. is dominated by six row cultivars with a vast majority of acreage dominated by Chapais. Leger, the former widely grown cultivar, occupies only a small acreage. However, some farmers who require a large quantity of straw are changing back to this cultivar.

Barley acreage has doubled in the past ten years. It is now the most widely grown feed grain in N.B. at 30,000 acres, surpassing oat acreage since 1989. This rapid increase in barley acreage has been due to excellent public breeding and evaluation programs in eastern Canada. These programs are essential for the long term economic competitiveness of N.B. grain producers.

MATERIALS AND METHODS: Sixteen barley cultivars were planted at Sussex, Grand Falls, and Bathurst on April 30, May 15, and May 22 resp. A Wintersteiger plot seeder with 12 cm row spacing was used to plant the seed in 2 X 8 m plots. The seeding rate was 350 vk/m^2 and plot design was R.C.B. with four replications. The plot sites at Sussex and Bathurst received a broadcast application of 250 kg/ha of 17-17-17 that was incorporated prior to planting. At Grand Falls, 200 kg/ha of 17-17-17 was broadcast and incorporated. An additional 150 kg/ha of 34-0-0 was broadcasted on all plots at Sussex at G.S. 31. All plots at Grand Falls and Bathurst received an additional application of 180 kg/ha of 34-0-0 at G.S. 31. Blagal (840 g ai/ha), Tilt (125 g ai/ha), and Cycocel (200 g ai/ha) were applied to all plots, at all locations, as a tank mixture at G.S. 21 with a small plot sprayer. A Hege 140 plot combine was used to harvest the plots on Aug. 8, 14, and 30 at Sussex, Grand Falls, and Bathurst resp.

RESULTS AND DISCUSSION: The sixteen barley varieties had yields ranging from 4.8 - 3.8, 4.9 - 4.3, and 2.9 - 1.8 T/ha at Sussex, Grand Falls and Bathurst respectively (Table 1,2,3). The higher yields at the Sussex and Grand Falls sites can be attributed to earlier planting, higher fertility and better moisture distribution. The Bathurst site was on land that had recently been reclaimed after being abandoned for several years. This along with very dry conditions during the growing season resulted in low yields relative to the other two sites.

The most widely grown cultivar in the province had relatively high yields at both Grand Falls and Bathurst surpassing all recommended cultivars except Morrison at Bathurst (Table 2 & 3). At Sussex, Chapais had a disappointing yield and was ranked second from the bottom (Table 1). There is no obvious reason for this poor performance other than site to site and year to year variability.

The four lines: QB 232.7, OA 26, AB 99-13, and DB 68 had consistently high yields across all locations (Table 1,2,3). These lines, particularly QB 232.7, appear to be well suited for N.B. growing conditions and could eventually replace some of the older cultivars on the recommended list. Robust, a popular cultivar in the State of Maine, does not have any significant yield advantage over any of the recommended cultivars and therefore it is doubtful if this cultivar becomes widely grown in N.B.

CONCLUSIONS: These trials continue to be an important tool in identifying the highest yielding, most widely adapted cultivar/lines for barley production in N.B. They also serve as an excellent extension tool to show farmers the newer, more promising barley lines. This testing program is essential and will be continued in the future.

ACKNOWLEDGEMENTS: The authors wish to thank Stephen Moffet of Sussex, Baron Tepper of Grand Falls and Rod Archibald of Bathurst for plot land. Appreciation is also extended to summer staff: Jennifer Eckstein, Angela MacFarlane, and Gary Leroux.

TABLE 1: Yield and Agronomic Characteristics of Barley Cultivars - Sussex 1991

Cultivar	Yield (T/ha)	Plant Height (cm)
QB 232.7	4.8 a	82.2 ab
DA 26	4.6 ab	73.2 def
AB 99-13	4.5 ab	83.0 a
DB 68	4.5 ab	69.8 fg
Robust	4.4 ab	75.8 cd
Leger	4.4 ab	81.5 ab
MB 88-3	4.2 ab	67.8 g
Harrington	4.0 ab	68.0 g
OB 907-33	3.9 ab	78.2 bc
AB 97-3	3.9 b	75.0 cde
TBR 579-5	3.9 b	68.2 g
Albany	3.8 b	70.2 fg
Morrison	3.8 b	70.0 fg
QB 243.83	3.8 b	71.2 efg
Chapais	3.8 b	73.2 def
Duke	3.8 b	69.8 fg
LSD (.05)	0.9	4.3
C.V. (%)	15.8	4.1

TABLE 2: Yield of Barley Cultivars - Grand Falls 1991

Cultivar	Yield (T/ha)
DA 26	4.9 a
AB 99-13	4.9 a
QB 232.7	4.9 a
Harrington	4.8 ab
Chapais	4.7 ab
DB 68	4.7 ab
QB 243.83	4.6 ab
Leger	4.5 ab
TBR 579-5	4.5 ab
Robust	4.5 ab
OB 907-33	4.5 ab
AB 97-3	4.5 ab
Duke	4.5 ab
MB 88-3	4.4 ab
Albany	4.3 b
Morrison	4.3 b
LSD (0.05)	0.6
C.V. (%)	8.7

TABLE 3: Yield of Barley Cultivars - Bathurst 1991

Cultivar	Yield (T/ha)
QB 232.7	2.7 a
Morrison	2.7 ab
DB 68	2.6 abc
OB 907-33	2.6 abc
Chapais	2.5 abc
TBR 579-5	2.4 abc
AB 99-13	2.4 abc
QB 243.83	2.3 abcd
DA 26	2.3 abcd
Leger	2.2 abcd
Albany	2.2 bcd
AB 97-3	2.1 bcd
MB 88-3	2.1 cd
Robust	2.1 cd
Harrington	1.8 d
Duke	1.8 d
LSD (.05)	0.6
C.V. (%)	18.7

CHAPAIS BARLEY AND BELVEDERE WHEAT UNDERSEEDING STUDY HARTLAND 1991

D.F. Walker & A.O.M. Smith

ABSTRACT: Chapais barley and Belvedere spring wheat were underseeded with 7 different forage crops and a non-underseeded check on two dates at Hartland. Five parameters, yield, TKW, kernels/head, plant height, and lodging were collected. Yields of the Chapais barley and Belvedere spring wheat ranged from 4.7 - 3.7 and 4.8 -4.1 T/ha resp. across all underseeded forage treatment. TKW (thousand kernel weight) of the barley was closely related to yield declining from 46.6 to 42.8 g. Delaying planting from May 14 to June 3 reduced barley and wheat yield from 4.2 - 3.6 and 4.5 - 2.3 T/ha resp. TKW in the wheat was significantly different but appeared to be unrelated to yield. Kernels/head was not significantly different in either species for any treatment. Plant height in barley was significantly different and was reduced as yields declined. Plant height in wheat was not significantly affected by treatment. Four physical soil parameters, saturated conductivity, bulk density, % porosity, and % air filled pores were measured on Chapais barley. Significant differences did occur; however, it was extremely difficult to draw conclusions. Root-lesion nematode populations were too inconsistent to draw conclusions.

ÉTUDE DE LA CULTURE EN SOUS-SEMIS DE L'ORGE CHAPAIS ET DU BLÉ BELVEDÈRE - HARTLAND 1991

D.F. Walker et A.O.M. Smith

RÉSUMÉ : À deux différentes dates, on a contre-ensemencé à Hartland de l'orge Chapais et du blé Belvedère de printemps avec sept différentes plantes fourragères et ensemencé un champ témoin. On y a mesuré cinq paramètres : le rendement, le poids de mille grains, les grains ou têtes, la hauteur des plants et la verse des tiges. Le rendement de l'orge Chapais et du blé Belvedère de printemps variait entre 4,7 et 3,7 et 4,8 et 4,1 t/ha respectivement dans tout le champ contre-ensemencé. Le poids de mille grains de l'orge a baissé de 46,6 à 42,8 g et avait un rapport étroit avec le rendement. L'ensemencement plus tardif du 3 juin en comparaison avec celui du 14 mai a entraîné un rendement moins élevé d'orge et de blé de 3,6 par rapport à 4,2 t/ha et de 2,3 par rapport à 4,5 t/ha respectivement pour l'orge et le blé. Le poids de mille grains de blé différait considérablement, mais semblait n'avoir aucun rapport avec le rendement. Les grains ou têtes ne présentaient pas d'écarts marqués d'une espèce à l'autre et selon les méthodes de culture. La hauteur des plants d'orge différait considérablement et diminuait en fonction de toute baisse du rendement. Les méthodes de culture n'ont pas tellement influé sur la hauteur des plants de blé. On a mesuré pour l'orge Chapais quatre caractéristiques du sol : la perméabilité du sol saturé, la masse volumique en vrac, la porosité et le pourcentage de pores remplis d'air. On a constaté de grands écarts, mais il était extrêmement difficile de tirer des conclusions. Il a été aussi impossible d'arriver à des conclusions en ce qui concerne les nématodes des racines en raison de résultats trop variables.

INTRODUCTION: The purpose of underseeding was to establish two crops at one time, therefore eliminating the cost of establishing the second crop. This practise has frequently resulted in unsatisfactory yield or establishment of one of the crops, depending on weather condition in the establishment year.

In the past, underseeding a cereal plot with forages was not recommended due to a number of factors. Weed control was usually more difficult and frequently unsatisfactory. Grain harvest was often more difficult particularly when harvest was delayed due to poor weather. Forage establishment is suppressed when conditions are ideal for cereal growth resulting in an unsatisfactory forage stand. These difficulties still remain; however, the low grain prices since the mid 1980's has redirected the focus of grain production in the potato belt from one of high grain yield to maximizing rotational benefits.

Grain is an excellent rotation crop in that it breaks disease cycles, establishes quickly, reducing erosion, improves soil structure, and provides a cash crop. From a soil point of view, grain is highly beneficial up until approximately 15 days prior to harvest. At this point the root system dies and no further soil building activity takes place. A grain crop underseeded to forages will continue the soil building process until ploughed in late fall. Even though underseeding requires greater attention to weed control and can result in lower grain yields and/or poor forage establishment, some producers are willing to make these sacrifices for a higher pay off in a rotation crop.

Each individual forage crop has its advantages and disadvantages. Legumes fix nitrogen and improve soil structure, thereby benefiting the following crop. However, it has been suggested that red clover is a host for nematodes and some diseases. Forage grasses do not fix nitrogen, therefore require fertilizer applications. However, they are superior to legumes in building soil structure and are a non-host for nematodes and many potato diseases.

The purpose of this experiment was to evaluate the compatibility of grain underseeded to forages and the effects on grain yield, harvesting, weed control, forage establishment, nematode population and soil physical parameters.

MATERIALS & METHODS: Chapais barley and Belvedere spring wheat were underseeded with various forage grasses/clovers (Table 1,2,3,4) at Hartland, N.B. A non-underseeded check was also included in the study as a standard. The first study was planted on May 14 with a 12 cm row spacing and the second study was planted on June 3 with a row spacing of 18 cm. Plot design was R.C.B. with four replications and plot size was 4 X 8 m. The cereals were planted at a rate of 350 vk/m^2 and the underseeded forages were planted at approximately half their recommended seeding rate (for a pure stand)(Table 1,2,3,4). An application of 150 kg/ha of 17-17-17 was broadcast and incorporated over the plot site just prior to planting. The legumes used in this study were inoculated with the proper rhizobia just before planting. All plots were sprayed with Tropotox Plus (4 l/ha), Tilt (125 g ai/ha), and Cycocel (200 g ai/ha) at G.S. 21 as a tank mixture in a small plot sprayer. The barley in the first study was harvested on Aug. 13 and the wheat on Aug. 24. Both of the barley and wheat studies planted on June 3 were harvested on Sept. 4. After each grain harvest, an application of 115 kg/ha of 34-0-0 was broadcast in order to enhance the establishment/regrowth of the underseeded forage crop. Prior to planting, a soil sample was collected in order to determine initial nematode populations. A sample was also collected from each underseeded barley plot after the grain was harvested and again just before late fall ploughing. A three inch core sample was also collected before late fall ploughing to determine the effect of the underseeeded forage on various physical soil parameters. One to two inches of loose soil was removed before the core was taken.

RESULTS & DISCUSSION: The underseeded forage treatments had a significant effect on grain yield of Chapais barley on the May 14 planting date. Two treatments, D.C.R.C. and Timothy had yields significantly higher than the check. Four other treatments, Lemtal-F.P.C., Lemtal, Alfalfa and F.P.C. had higher yields, although not significant (Table 3). Aubade ryegrass was the only treatment to reduce yields lower than the check. It appears that the 6 treatments that increased yields had some beneficial effect on grain growth. The nitrogen fixing capability of the two clovers and one alfalfa could explain some of the beneficial effect but does not suggest why or how the two grass species, Timothy and Lemtal ryegrass, increased yields (Table 3). Competition for nutrients and water should have reduced grain yields of the underseeded crops. The one possible explanation is that the forage species of the six undereseeded treatments were not competitive in the early stages of the grain growth and development and therefore provided little competition. The Aubade ryegrass, the most aggressive forage species, did reduce yields and therefore it can be concluded that the competition was sufficient enough to reduce grain yields.

TKW and plant height were both significant and declined as yield declined (Table 3). The close relationship of yield, TKW and plant height support each other suggesting that the underseeded forages had a very strong positive influence on yield compared to the check. Increasing crop competition normally reduces grain yield. These results are highly irregular and do not support the findings of Walker and Smith 1990.[1]

Kernels/head was not affected by any underseeded forage treatment (Table 3).

Wheat yields were significantly reduced by only two treatments, Lemtal and Aubade ryegrass (Table 1). A third treatment which included Lemtal reduced yields, however, not significantly. The remaining four treatments, F.P.C., Timothy, D.C.R.C. and Alfalfa had yields very close to the check. The forage treatments did not appear to have any beneficial effect on wheat yields as occurred in the barley treatments (Table 1).

It appears that the aggressive growth habit of both ryegrasses and the ryegrass-F.P.C. mixtures provided enough competition to reduce yields. These results agree with those found by Walker and Smith 1990. The reduced yields also confirm visual observations made at harvest when ryegrass heads were higher then both the wheat and barley crops. The head and stalks of the ryegrass remained green after the grain had matured, suggesting that harvesting difficulties could occur during wet harvest periods. Lemtal ryegrass (Italian types) do not produce a seed head in the planting year and therefore its low growth habit would not cause harvesting difficulties.

Grain yields of both wheat and barley were reduced by the delayed seeding date (Table 2,4). Reduced yields as a result of delaying seeding is well documented by Walker and Duivenvoordon, 1987. On the June 3 seeding date for Chapais barley, there was no significant yield difference caused by the underseeded forage; however, the two lowest yielding treatments were the Aubade ryegrass and the Lemtal ryegrass-F.P.C. mixture (Table 4). Belvedere wheat grain yields were significantly affected by the underseeded forage crops (Table 2). The lowest treatment was the Alfalfa at 1.8 T/ha.

The underseeded forage treatments had little effect on soil physical parameters: saturated conductivity, bulk density, and porosity or macro pores (Table 3,4). The only areas where there could have been some response are in the percent macro pores and saturated conductivity between the two planting dates. The earlier planting date appeared to have a larger percentage on macro pores and a higher saturated conductivity (Table 3). The earlier planting date also had a longer duration to "pull the soil together" creating a higher percentage of macro pores allowing greater conductivity. Even though physical parameters were only slightly altered , the heavy forage growth of the ryegrass plots would have eliminated any erosion and would aid in nutrient cycling.

In the May 14 planting of Belvedere wheat there were significant differences in after harvest root-lesion populations ranging from 4903 to 1338/kg of dry soil for Felix Persian Clover(F.P.C.) and the Lemtal Ryegrass-Felix Persian Clover treatments resp.(Table 5). These results appear contradictory because both treatments involve F.P.C. However, the two lowest nematode treatments both had Lemtal Ryegrass underseeded. Species percentages were not taken in the Lemtal-F.P.C. mixture;

however, visual observations suggest that the level of F.P.C. was low indicating that the clover would have had little influence on nematode populations. This would then suggest that both treatments that had Lemtal Ryegrass as the major forage component had the lowest nematode populations (Table 5). It should be noted that the above conclusions were based on an experiment that had a very high CV and LSD values (Table 5). However, these conclusions agree with those found by Kimpinski on Prince Edward Island (Kimpinski, 1991).

In the May 14 planting of Chapais barley there was no significant difference in before ploughing root nematode populations even though numbers ranged from 2180 -6023 (Table 5). The high[illegible] population was under the Lemtal ryegrass-F.P.C. mixture. These results ran counter to those found with the wheat underseeded treatments.

Kimpinski also found that in the late fall, many nematodes are in the plant roots and not detectable in soil samples (Kimpinski, 1991). This could explain the lack of any strong trend in nematode populations in both the barley and wheat. After ploughing and plants die, nematodes tend to migrate out into the surrounding soil. Soil samples taken after ploughing in the late fall or early spring could give a truer indication of nematode populations.

CONCLUSIONS: Underseeding forage crops will influence grain yield. In the case of barley, yields were increased by some treatments and decreased by others, however with both wheat and barley it does appear that Aubade Ryegrass will cause yield declines. Delaying seeding and increasing row width reduced yields for both wheat and barley. There is evidence to suggest that the longer the grain and forage crop is established there will be an increase in % macro pores and conductivity. Considering all forage treatments across barley and wheat there appears to be little consistency in root-lesion populations. Therefore it is difficult to suggest that any one forage species or variety is better at reducing nematode populations.

This experiment will continue in 1992 in an attempt to confirm some of the soil and nematode results.

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TABLE 1: Yield and Agronomic Characteristics of Belvedere Wheat Underseeding Study Hartland 1991

Planting Date: May 14/91 - Row Width 12

Treatment*	Seeding Rate (kg/ha)	Yield (T/ha)	TKW (g)	Kernals/ Head	Plant Height (cm)
F.P.C.	4	4.8 a	35.8 b	40.3 a	87.8 a
Check	-	4.7 ab	35.8 b	38.6 a	87.5 a
Timothy	4	4.7 ab	36.7 b	41.3 a	88.8 a
D.C.R.C.	6	4.7 ab	38.0 a	40.7 a	86.5 a
Alfalfa	6	4.6 ab	36.3 b	40.0 a	84.5 a
L.R.-F.P.C.	5-3	4.2 ab	35.8 b	42.1 a	82.5 a
Lemtal R.	10	4.1 b	36.0 b	41.4 a	86.0 a
Aubade R.	10	4.1 b	35.8 b	39.9 a	84.5 a
LSD (0.05)		0.7	1.2	3.9	7.9
C.V. (%)		10.8	2.3	6.6	6.2

* D.C.R.C.- Double Cut Red Clover
F.P.C.- Felix Persian Clover
L.R.- Lemtal Ryegrass

Harvest Date: August 24, 1991

TABLE 2: Yield and Agronomic Characteristics of Belvedere Wheat Underseeding Study Hartland 1991

Planting Date: June 3/1991 - Row Width 18

Treatment*	Seeding Rate (kg/ha)	Yield (T/ha)	TKW (g)	Kernals/ Head
Timothy	4	2.6 a	27.7 ab	38.8 b
F.P.C.	4	2.6 a	26.9 b	39.7 ab
L.R.-F.P.C.	5-3	2.4 a	27.7 ab	40.1 ab
Check	-	2.4 ab	27.9 ab	39.5 ab
Lemtal R.	10	2.3 ab	28.6 ab	42.7 a
D.C.R.C.	6	2.3 ab	28.1 ab	39.5 ab
Aubade R.	10	2.2 ab	27.4 b	39.6 ab
Alfalfa	6	1.8 b	29.2 a	38.4 b
LSD (0.05)		0.6	1.7	3.7
C.V. (%)		17.5	4.2	6.4

* D.C.R.C.- Double Cut Red Clover
F.P.C. - Felix Persian Clover
L.R. - Lemtal Ryegrass

Harvest Date: September 4, 1991

TABLE 3: Yield and Agronomic Characteristics of Chapais Barley Underseeding Study - Hartland 1991

(Planting Date: May 14/91 - Row Width 12)

Treatment *	Seeding Rate (kg/ha)	Yield (T/ha)	TKW (g)	Kernels/ Head	Plant Height (cm)	Saturated Conductivity (cm/hr)	Bulk Density (g/cm^3)	Porosity (%)	Air Filled Pores** (%)
D.C.R.C.	6	4.7 a	46.6 a	42.8 a	70.8 ab	12.6 ab	1.4 a	49.1 a	5.2 ab
Timothy	4	4.6 ab	45.2 ab	42.9 a	71.3 a	9.4 ab	1.4 a	48.4 a	4.7 ab
L.R.-F.P.C.	5-3	4.2 abc	45.6 ab	42.4 a	67.0 abc	13.5 ab	1.4 a	48.7 a	4.8 ab
Lemtal R.	10	4.2 bcd	44.9 abc	42.6 a	68.0 abc	10.5 ab	1.4 a	49.2 a	4.8 ab
Alfalfa	6	4.1 cd	45.7 ab	42.0 a	64.0 bc	6.7 b	1.4 a	49.0 a	4.4 b
F.P.C.	4	4.1 cd	44.8 abc	43.3 a	64.5 abc	10.1 ab	1.4 a	48.3 a	4.3 b
Check	-	3.9 cd	43.6 bc	41.9 a	62.3 c	8.4 ab	1.4 a	47.7 a	6.5 a
Aubade R.	10	3.7 d	42.8 c	40.7 a	62.8 c	15.8 a	1.4 a	49.2 a	6.2 ab
LSD (0.05)		0.5	2.2	2.8	6.8	8.3	0.1	3.4	2.0
C.V. (%)		8.4	3.3	4.5	6.9	51.8	4.6	4.8	26.6

* D.C.R.C. - Double Cut Red Clover
F.P.C. - Felix Persian Clover
L.R. - Lemtal Ryegrass

Harvest Date: August 13, 1991

**Percentage of air filled pores at 80 cm of water tension

TABLE 4: Yield and Agronomic Characteristics of Chapais Barley Underseeding Study - Hartland 1991

(Planting Date: June 3/91 - Row Width 18)

Treatment *	Seeding Rate (kg/ha)	Yield (T/ha)	TKW (g)	Kernals/ Head	Saturated Conductivity (cm/hr)	Bulk Density (g/cm^3)	Porosity (%)	Air Filled Pores** (%)
F.P.C.	4	3.9 a	42.8 a	44.9 a	8.0 a	1.3 b	51.3 a	3.8 a
Lemtal R.	10	3.6 a	43.6 a	44.2 a	8.7 a	1.4 ab	48.6 ab	3.3 a
Check	-	3.6 a	43.2 a	43.6 a	12.6 a	1.4 ab	48.2 ab	3.6 a
Timothy	4	3.6 a	42.4 a	44.4 a	6.9 a	1.4 a	47.5 b	4.1 a
Alfalfa	6	3.5 a	43.5 a	44.4 a	9.3 a	1.4 a	47.3 b	3.9 a
D.C.R.C.	6	3.4 a	43.6 a	44.5 a	12.4 a	1.3 ab	49.8 ab	3.8 a
Aubade R.	10	3.4 a	42.0 a	44.2 a	6.5 a	1.4 a	47.9 b	4.6 a
L.R.-F.P.C.	5-3	3.4 a	43.4 a	44.6 a	9.7 a	1.4 ab	48.4 ab	3.2 a
LSD (0.05)		0.9	2.7	2.8	11.0	0.1	3.1	2.5
C.V. (%)		17.3	4.3	4.3	80.8	4.1	4.3	44.7

* D.C.R.C. - Double Cut Red Clover
F.P.C.- Felix Persian Clover
L.R. - Lemtal Ryegrass

Harvest Date: September 4, 1991

** Percentage of air filled pores at 80 cm water tension

TABLE 5: Root-lesion Nematodes of Chapais Barley and Belvedere Wheat Underseeding Study Hartland 1991

Treatment *	Before Ploughing Root-lesion Nematodes /kg of Dry Soil	Before Ploughing Root-lesion Nematodes /kg of Dry Soil	After Harvest Root-lesion Nematodes /kg of Dry Soil
	Chapais Barley	Belvedere Wheat	Belvedere Wheat
Check	2180 a	3550 ab	3715 ab
Timothy	2889 a	2100 a	4160 ab
F.P.C.	3007 a	1768 a	4903 a
Lemtal Ryegrass	3643 a	3767 ab	2526 ab
Alfalfa	3942 a	1632 a	2526 ab
Aubade Ryegrass	4438 a	6967 b	2823 ab
D.C.R.C.	4897 a	4138 ab	3566 ab
L.R.-F.P.C.	6023 a	1124 a	1338 b
LSD (.05)	4288	4791	3252
CV (%)	75.3	104.0	69.2

* D.C.R.C. - Double Cut Red Clover
F.P.C. - Felix Persian Clover
L.R. - Lemtal Ryegrass

SPRING CANOLA CULTIVAR STUDY - HARTLAND 1991

D.F. Walker and A.O.M. Smith

ABSTRACT: Twenty-two spring canola cultivars were planted at Hartland on May 14. Yields ranged from 2.1 - 1.2 T/ha. Quality was very good with four cultivars achieving Canada No. 1. Days to maturity ranged from 114 - 122.

ÉTUDE DES CULTIVARS DE CANOLA DU PRINTEMPS - HARTLAND 1991

D.F. Walker et A.O.M. Smith

RÉSUMÉ : Trente-deux cultivars de canola de printemps ont été plantés à Hartland le 14 mai. Les rendements variaient entre 2,1 et 1,2 t/ha. Quatre cultivars ont produit des plants de très bonne qualité pour un canola de la classe Canada n° 1. Il a fallu aux plants de 114 à 122 jours pour arriver à maturité.

INTRODUCTION: Canola (rapeseed) is a non-legume, high protein, high oil content crop. It should be a natural for N.B. as it has a relatively short season, is not affected by frost and grows well in a cool moist climate. It will grow on low pH soils, tolerate conditions of medium to low fertility and wet soils. Canola is also relatively high valued when compared to the traditional grain crops: wheat, barley, and oats. There has been a reluctance to grow canola because producers have to modify production practices. Seeding rates are lower than conventional grain (5-7 kg/ha) requiring a small seed box. It must be either swathed or desiccated and handling equipment ie. bulk bodies, have to be much tighter to avoid seed loss. A higher level of storage management is required to avoid heating.

There has been a renewed interest in canola. Field observations have indicated that other brassicas (broccoli) when planted in rotation with potatoes results in a significant increase in yield and quality. It has been suggested that the yield and quality increase are a result of reduced disease levels (early die down complex). The speculation is that the decomposing brassica (broccoli) residue produces a natural soil fumigant (iso thio cyanic gas) which reduces nematode populations which in turn reduces stress on the potato plant, thereby reducing root infection diseases.

The objective of this study was to evaluate the production feasibility of canola and to determine if it would reduce nematode populations.

MATERIALS & METHODS: Twenty-two spring canola cultivars were planted at Hartland on May 14 in a R.C.B. design with four replications. Row spacing was 12 cm and the seeding rate was 5 kg/ha. Individual plot size was 2 X

8 m. Prior to planting, 150 kg/ha of 17-17-17 was broadcast and incorporated. Muster (22.5 g ai/ha) and Agral 90 (0.2 % v/v) was applied with a small plot sprayer post emergence. A soil sample was collected before planting and after harvest to determine nematode population. All plots were harvested on Sept. 3 with a Hege 140 plot combine.

RESULTS & DISCUSSION: Yields ranged from 2.1 - 1.2 T/ha for the 22 cultivars in the canola test (Table 2). These yields are excellent considering that the crop was not desiccated or swathed prior to harvest. Yields in 1990 were much higher ranging from 2.5 - 1.9 T/ha (Walker and Smith, 1990). The lower yields in 1991 could be explained by the high shattering losses prior to harvest and combine losses during harvest.

The excessive losses at harvest were indicated by the large number of seeds on the ground after combining. These harvest losses are difficult to avoid in a small plot situation which includes cultivars of different maturity. Heavy and continuous rains prior to harvest also made field operations difficult which also could explain the large harvest loss. No estimate of harvest loss was made; however, visual estimates suggest they could be as high as 0.5 T/ha or more.

Lodging did not occur on any cultivar or plot. Plant heights ranged from 99 - 114 cm (Table 2). Plant heights appeared short compared to 1990 plots; however, plant height data was not recorded in 1990 therefore no comparison can be made.

Days to maturity ranged from 114 - 122 (Table 2). This a longer than the small grains, wheat, oats, and barley but should not pose a problem for commercial growers.

Treflan (ppi) is normally the herbicide of choice for controlling weeds in canola. Incorporating equipment was unavailable at planting, therefore Treflan was not utilized. Muster, a relatively new chemical, was applied postemeregence with excellent results. In the future, Muster will be used on all canola and mustard small plot experiments.

Four of 22 cultivars graded Canada No. 1 (Table 2). The excellent grades were surprising considering the delayed harvest and wet weather prior to harvest. There were 18 samples that were down graded because of green seeds (immature). Most of the immature seeds came from the plants at the end of the plots which tillered producing stems with later maturing seeds. In commercial production, this would occur to a much lesser extent as headlands are a very small percentage of the total field.

Desiccation or swathing would also help to eliminate green seed contamination.

Lab results indicating nematode populations were not available at time of publication.

CONCLUSION: For the second year in a row, canola cultivar trials have yielded very well. Agronomically the crop continues to demonstrate that it is well suited for production in the region. In both years of the evaluation, crop quality was excellent and difficulties associated with lodging, insects, diseases, maturity, and weed control did not occur. If markets could be found, it appears that canola could become a viable cash crop in N.B. Cultivar evaluation will continue in 1992.

ACKNOWLEDGEMENTS: The authors wish to thank Gerald and Alvin Springer for plot land and appreciation is also extended to summer staff: Charles Turner, Jennifer Eckstein, Angela MacFarlane, and Gary Leroux.

REFERENCES: Walker, D.F. and Smith, A.O.M. 1990. Spring Canola Cultivar Evaluation - Hartland. Adaptive Research Reports, N.B. Dept. of Agriculture. 12:104-106.

TABLE 1: Soil Analysis Report - Hartland 1991

Sample Depth (cm)	pH	Phosphate (kg/ha)	Potash (kg/ha)	Calcium (kg/ha)	Magnesium (kg/ha)
0 - 15	5.6	999+	450+	1431	321
15 - 30	5.6	845	450+	1438	320
30 - 45	5.5	234	293	895	163

TABLE 2: Yield and Agronomic Data of Spring Canola Cultivars - Hartland 1991

Cultivar	Yield (T/ha)	Plant Height	Days to Maturity	Grade *
Hyola 401	2.1 a	99.0 e	114.0 a	1
Cyclone	1.9 ab	102.8 bcde	114.0 a	3
Global	1.9 ab	108.8 abc	122.0 d	SA
SV02406	1.9 ab	106.8 abcde	118.8 c	2
WW 1432	1.8 bc	99.3 de	117.0 bc	1
Mermaid	1.8 bc	102.0 bcde	114.8 ab	2
Celebra	1.8 bcd	105.0 bcde	118.8 c	3
Scana	1.8 bcd	102.3 bcde	116.3 ab	2
Delta	1.8 bcd	103.8 bcde	116.3 ab	1
Bounty	1.7 bcde	103.0 bcde	114.0 a	2
Kristina	1.7 bcde	102.8 bcde	117.0 bc	1
WW 1529	1.6 cdef	105.0 bcde	122.0 d	2
OAC Triumph	1.6 cdef	101.0 cde	118.8 c	3
Hyola 40	1.6 cdef	103.8 bcde	114.0 a	2
Profit	1.6 cdef	114.0 a	115.5 ab	SA
Semu DNK 86/223	1.5 def	110.0 ab	122.0 d	3
Stallion	1.5 ef	104.5 bcde	117.0 bc	3
Legend	1.5 ef	102.5 bcde	114.0 a	3
HC-120	1.5 ef	108.5 abc	114.0 a	3
Vanguard	1.4 fg	101.8 bcde	114.8 ab	3
Westar	1.4 fg	103.5 bcde	114.0 a	3
HC-110	1.2 g	107.5 abcd	114.0 a	3
Mean	1.6	104.4	116.5	
LSD (0.05)	0.2	8.4	2.3	-
C.V. (%)	9.9	5.7	1.4	-

* Grade 1 - Canada No. 1
2 - Canada No. 2
3 - Canada No. 3
SA - Sample Account

LUPIN CULTIVAR EVALUATION
SUSSEX, HARTLAND, GRAND FALLS 1991

D.F. Walker & A.O.M. Smith

ABSTRACT: Yields ranged from 3.3 - 2.8, 3.4 - 2.5, and 3.5 - 2.4 T/ha at Sussex, Hartland, and Grand Falls resp. One-hundred seed weight ranged from 42.6 - 35.1, 39.4 - 32.0, and 35.2 - 32.0 g for Sussex, Hartland, and Grand Falls resp. At all three locations, Kiev Mutant had the highest 100 seed wt. Other parameters including pods/plant, beans/pod, plant height, and plant population were only recorded for the Sussex location.

ÉVALUATION DES CULTIVARS DE LUPIN
SUSSEX, HARTLAND, GRAND-SAULT 1991

D.F. Walker et A.O.M. Smith

RÉSUMÉ : Les rendements variaient entre 3,3 et 2,8 t/ha à Sussex, 3,4 et 2,5 t/ha à Hartland et 3,5 et 2,4 t/ha à Grand-Sault. Le poids d'une centaine de grains variait entre 42,6 et 35,1 g à Sussex, 39,4 et 32 g à Hartland et 35,2 et 32 g à Grand-Sault. Aux trois endroits, Kiev Mutant a enregistré le plus haut poids par cent grains. On a mesuré seulement à Sussex d'autres paramètres comme le nombre de gousses par plant et de grains par gousse, la hauteur du plant et le nombre de plants.

INTRODUCTION: Lupins (Lupinus L.) are a high yielding protein crop that have production potential in N.B. On farm and small plot work indicates that lupin yields can be superior to soybeans. It is unaffected by frost and therefore can be planted very early in the spring and continues to grow well beyond the earliest fall frost. Its high yield potential could be due to its ability to maximize the growing season in the cool northern climate of New Brunswick.

Lupins are a legume crop, therefore the plant produces its own nitrogen. Field and plot observations indicated that there is little response to the other major fertility elements, phosphorus and potash. This suggests either that lupins have an excellent mechanism for retrieving these elements from low fertility soils or have low requirements for these two elements. Unlike soybeans, lupins do not contain a trypsin inhibitor, therefore seed does not have to be heat treated prior to feeding non-ruminant animals. Feeding observations indicate that lupins are equal to or superior to soybeans when fed to all classes of livestock.

Two weak points that could reduce the widespread production of lupins are susceptibililty to diseases and late maturity. Rhizictonia and Ascochyta Blight were noted in field plots and in farm fields resulting in strongly reduced lupin yields in 1990 (Johnston, Walker and Smith, 1990).

The predominant variety of lupins grown in eastern North America is sweet white. Its normal harvest date is mid to late October and at this time of year there are few harvest days and in many cases fields are wet causing harvest difficulties. The late maturity will have to be overcome by either finding a variety that is earlier maturing or limiting production to only well drained fields.

Lupins are a new crop to N.B., therefore the purpose of this project was to evaluate the suitability of a number of cultivars for production potential in N.B.

MATERIALS & METHODS: A Wintersteiger plot seeder was used to plant a lupin cultivar study in Sussex on April 30, Hartland on May 13, and Grand Falls on May 21. Five to six cultivars were planted at 160 kg/ha in a Randomized Complete Block Design with four replications. The plots were 2 X 8 m with a 12 cm row spacing. All plots received a preemerge application of Lorox (2 kg/ha). Seed was inoculated just prior to planting. All plots were harvested with a Hege plot combine in Sussex on October 9, Hartland on October 24, and Grand Falls on October 25.

RESULTS & DISCUSSION: Significant yield differences occurred at Sussex and Hartland (Table 1,2). However, with the exception on Sweet White, there did not appear to be any cultivar that had a consistently high yield advantage. The Sweet White lupin strain had the second highest yield at both Sussex and Hartland and was equal to the highest yielding cultivar at Grand Falls (Table 1,2,3). Sweet White is the strain most widely grown by N.B. farmers and at the present time appears to be the best choice.

Seed weight was significant and relatively consistent across all three locations (Table 1,2,3). The cultivar with the highest seed weight was Kiev Mutant. The remaining cultivars changed ranks but did not have the inconsistency to the same degree as yield.

Beans/pod and plant population did not show any significant differences at the Sussex location. Pods/plant and plant height was significant across cultivars but did not appear to have any influence on yield (Table 1).

Moisture content was only recorded at the Hartland location. Percent dry matter was not significantly different across any cultivar (Table 2). However, observations at harvest indicate that Sussex had the highest level of maturity, followed by Hartland, followed by Grand Falls. Although not quantified, moisture levels were very high in the Grand Falls seed samples. This could be due to a later planting date and a lower heat unit accumulation than the other two locations.

Lupins have a very strong stem and are not prone to lodging. However, in 1991 there was moderate lodging across all plots at Hartland and slight but random lodging at Grand Falls. The only explanation for lodging at these two locations would be the excessive rain received late in the growing season.

CONCLUSION: It appears that the Sweet White lupin strain now grown commercially by farmers in N.B. is equal to or better than any of the five cultivars that were tested. Evaluation of lupin cultivars will be discontinued until promising lines become available. The N.S. Dept. of Agriculture has initiated a breeding program on lupins. The N.B. Dept. of Agriculture will co-operate with and monitor progress of the N.S. program and will resume testing if and when new lines from that program become available.

ACKNOWLEDGEMENTS: The authors wish to thank Stephen Moffet of Sussex, Gerald and Alvin Springer, and Baron Tepper of Grand Falls for plot land. Appreciation is also extended to summer staff Charles Turner, Jennifer Eckstein, Angela MacFarlane, and Gary Leroux.

REFERENCES: Personal Communication with Dr. Winston Johnston, Ag Canada Research Station, Charlottetown, P.E.I.

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TABLE 1: Yield and Agronomic Characteristics of Lupin Cultivar Evaluation - Sussex 1991

Cultivar	Yield (T/ha)	100 Seed Weight (g)	Pods per Plant	Beans per Pod	Pod Height (cm)	Plant Pop/m^2
Start	3.3 a	35.1 d	4.9 b	4.2 a	30.4 cd	38.3 a
Sweet White	3.2 ab	40.1 b	4.9 ab	4.4 a	37.0 a	31.8 a
Skorospelz	3.1 abc	39.6 bc	5.3 a	4.3 a	35.7 ab	37.0 a
Kiev Mutant	3.0 abc	42.6 a	4.9 ab	4.1 a	33.1 bc	31.3 a
WTD 180	2.9 bc	38.5 c	5.1 ab	4.2 a	30.1 cd	34.8 a
Primorski	2.8 c	41.1 ab	5.1 ab	4.2 a	29.8 d	33.0 a
Mean	3.1	39.5	5.0	4.2	32.7	34.4
LSD (0.05)	0.4	1.6	0.4	0.5	3.0	8.7
C.V. (%)	7.9	2.6	5.0	8.1	6.1	16.8

TABLE 2: Yield and Agronomic Data of Lupin Cultivar Evaluation - Hartland 1991

Cultivar	Yield (T/ha)	100 Seed Weight (g)	% Dry Matter
Skorospelz	3.4 a	37.9 ab	76.4 a
Sweet White	3.1 ab	38.7 ab	74.9 a
Kiev Mutant	3.1 ab	39.4 a	75.3 a
Primorski	3.0 ab	35.5 bc	76.8 a
Start	2.8 bc	32.0 c	74.4 a
WTD 180	2.5 c	35.5 bc	75.4 a
Mean	3.0	36.5	75.5
LSD (0.05)	0.5	3.5	3.1
C.V. (%)	11.1	6.4	2.7

TABLE 3: Yield and 100 Seed Weight of Lupin Cultivar Evaluation - Grand Falls 1991

Cultivar	Yield (T/ha)	100 Seed Weight (g)
Sweet White	2.5 a	34.4 a
Kiev Mutant	2.5 a	35.2 a
WTD 180	2.4 a	32.0 b
Primorski	2.4 a	33.6 ab
Skorospelz	2.4 a	35.0 a
Mean	2.4	34.0
LSD (0.05)	0.3	1.9
C.V. (%)	8.4	3.6

SWEET WHITE LUPIN SEEDING RATE STUDY
SUSSEX & HARTLAND 1991

D.F. Walker and A.O.M. Smith

ABSTRACT: Yields ranged from 2.5 to 3.1 and 2.4 to 3.5 T/ha at Sussex and Hartland respectively. Significant yield decreases occurred at both locations at seeding rates below 100 kg/ha. At both locations, there was a trend towards reduced yields at seeding rates higher than 200 kg/ha. At Sussex, both the highest seed weights and largest number of pods/plant occurred at the lowest seeding rate (50 kg/ha) and declined gradually as seeding rate was increased. Secondary branching occurred at the two lowest seeding rates (50 and 100 kg/ha).

ÉTUDE DU TAUX D'ENSEMENCEMENT DES LUPINS BLANCS DOUX
SUSSEX ET HARTLAND 1991

D.F. Walker et A.O.M. Smith

RÉSUMÉ : Le rendement a varié entre 2,5 et 3,1 t/ha à Sussex et entre 2,4 et 3,5 t/ha à Hartland. On a constaté d'importantes baisses dans le rendement avec un taux d'ensemencement inférieur à 100 kg/ha. Aux deux endroits, on a remarqué une tendance à la baisse du rendement à des taux d'ensemencement supérieurs à 200 kg/ha. À Sussex, on a enregistré les poids de grains les plus élevés et le plus grand nombre de gousses par plant au plus bas taux d'ensemencement (50 kg/ha). Ces résultats diminuaient graduellement au fur et à mesure qu'augmentait le taux d'ensemencement. Aux plus bas taux d'ensemencement, on a constaté des ramifications secondaires.

INTRODUCTION: Lupins (Lupinus L.) are a high yielding protein crop that has production potential in N.B. On farm and small plot work indicates that lupin yields can be superior to soybeans. Lupins are unaffected by frost and therefore can be planted very early in the spring and will continue to grow well beyond the earliest fall frost. Its high yield potential is no doubt due to its ability to continue growing in the spring and fall when frost sensitive crops are restricted due to cold temperatures.

Lupins are a legume crop, therefore the plant produces its own nitrogen. Field and plot observations indicated that there is little response to the other major fertility elements, phosphorus and potash. This suggests either that lupins have an excellent mechanism for retrieving these elements from low fertility soils or have low requirements for these two elements. Unlike soybeans, lupins do not contain a trypsin inhibitor, therefore seed does not have to be heat treated prior to feeding non-ruminant animals. Feeding observations indicate that lupins are equal to or superior to soybeans when fed to all classes of livestock.

Two weak points that could reduce the widespread production of lupins are susceptibilitly to diseases and late maturity. Rhizictonia and Ascochyta Blight were noted in field plots and in farm fields strongly reducing lupin yields in 1990 (Johnston, and Walker and Smith, 1990).

The predominant variety of lupins grown in eastern North America is sweet white. Its normal harvest date is mid to late October and at this time of year there are few harvest days and in many cases fields are wet causing harvest difficulties. The late maturity will have to be overcome by either finding a variety that is earlier maturing or limiting production to only well drained fields.

Lupins are a new crop to N.B., therefore the purpose of this project was to further evaluate the suitability of Sweet White lupins for production potential in N.B.

MATERIALS & METHODS: A sweet white lupin seeding rate study was planted in Sussex on April 30 and another in Hartland on May 13. Both studies were planted with a Wintersteiger plot seeder with 12 cm row spacing. Plot design was R.C.B. with 4 replications and plot size was 2 X 8 m. Seeding rate was from 50 - 300 kg/ha in increments of 50. All lupin seed was inoculated just prior to planting. Lorox (2 kg/ha) was applied preemergent to all plots using a small plot sprayer. A Hege plot combine was used to harvest all plots in Sussex on Oct. 9 and in Hartland on Oct. 24.

RESULTS & DISCUSSION: At both Sussex and Hartland, yields increased significantly as seeding rate was increased from 50 - 100 kg/ha (Table 1,2). Beyond a seeding rate of 100 kg/ha, there was no significant difference in yield at either location. However, at Hartland, yields showed a non-significant yield increase up to a seeding rate of 200 kg/ha. Beyond 200 kg/ha, there was a non-significant yield decline (Table 2).

At Sussex, yields for the 100, 150, and 200 kg/ha seeding rate were identical. Beyond 200 kg/ha, there was a non-significant yield decrease (Table 1).

The decline in yield beyond a seeding rate of 200 kg/ha was not observed in 1990 (Walker and Smith, 1990). This could be due to the fact that yields in 1991 were higher than in 1990. It appears that from both an economic and yield point of view, optimum seeding rate ranges from 100 - 200 kg/ha.

At Sussex, seed weight, pods/plant and beans /pod all gradually declined as seeding rates were increased (Table 1). Conversely, plant population increased significantly as seeding rates increased up to a seeding rate of 150 kg/ha. Beyond a seeding rate of 200 kg/ha, there was no significant difference in plant population. This could be due to within crop competition causing the mortality of the weaker plants.

It appears that the lupin crop has the ability to compensate for low seeding rates by either increasing pods per plant, seeds per pod or seed weight. In the absence of within crop competition, secondary and tertiary branching can occur with pod development at each stage of growth. Later pod development will lead to delayed maturity and therefore delayed harvest.

At Sussex, secondary branching occurred at the 50 and 100 kg/ha seeding rates (Table 1). Due to the absence of within crop competition, secondary branching has occurred resulting in an undesirable delay in maturity of 2 - 3 weeks. Recommended seeding rates are often higher than those required to achieve optimum yield simply to avoid secondary branching and the subsequent delay in maturity.

CONCLUSIONS: It would appear that from an economic yield and secondary branching point of view, that the most appropriate seeding rate in 1991 was from 150 - 200 kg/ha. It also appears that severe within crop competition can cause yield decline with seeding rates higher than 200 kg/ha.

ACKNOWLEDGEMENTS: The authors wish to thank Stephen Moffet of Sussex and Gerald and Alvin Springer of Hartland for plot land used for these studies. Appreciation is also extended to summer staff: Charles Turner, Jennifer Eckstein, Angela MacFarlane, and Gary Leroux.

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Walker, D.F. and Smith, A.O.M. 1990. Lupin Seeding Rate Study - Sussex. Adaptive Research Reports, N.B. Dept. of Agriculture. 12:123-126.

TABLE 1: Yield and Agronomic Characteristics of Sweet White Lupin Seeding Rate Study - Sussex 1991

Seeding Rate (kg/ha)	Yield (T/ha)	100 Seed Weight (g)	Pods per Plant	Beans per Pod	Plant Pop/m^2	Secondary Branching *
50	2.5 b	44.7 a	6.9 a	4.8 a	17.5 d	16/39
100	3.1 a	43.2 ab	5.7 b	4.6 ab	24.5 c	10/15
150	3.1 a	41.6 bc	5.4 bc	4.4 abc	31.3 b	-
200	3.1 a	41.5 bc	5.1 bcd	4.2 c	36.0 ab	-
250	3.0 ab	40.7 c	4.8 cd	4.3 bc	35.0 ab	-
300	2.7 ab	40.9 c	4.5 d	4.1 c	40.0 a	-
LSD (0.05)	0.5	2.1	0.7	0.4	6.1	-
C.V. (%)	12.0	3.4	8.3	5.2	13.1	-

* Number of plants/m with secondary branching / number of secondary pods/m

TABLE 2: Yield and Agronomic Characteristics of Sweet White Lupin Seeding Rate Study - Hartland 1991

Seeding Rate (kg/ha)	Yield (T/ha)	Dry Matter (%)	100 Seed Weight (g)
50	2.4 b	74.0 a	39.0 a
100	3.0 a	76.2 a	38.8 a
150	3.2 a	75.9 a	38.0 a
200	3.5 a	76.1 a	38.6 a
250	3.1 a	76.4 a	38.5 a
300	3.3 a	76.6 a	37.8 a
LSD(0.05)	0.5	2.7	1.4
C.V. (%)	10.2	2.3	2.4

SPRING MUSTARD EVALUATION - HARTLAND 1991

D.F. Walker and A.O.M. Smith

ABSTRACT: Three strains of mustard were planted at Hartland, brown, oriental, and yellow with yields ranging from 1.5 to 1.5 to 1.3 T/ha respectively. Quality was variable ranging from Canada No. 1 for brown, sample account for oriental, and Canada No. 4 for yellow.

ÉVALUATION DES CULTIVARS DE MOUTARDE DU PRINTEMPS -HARTLAND 1991

D.F. Walker et A.O.M. Smith

RÉSUMÉ : On a planté à Hartland trois souches de moutarde et obtenu les rendements suivants : moutarde brune, 1,5 t/ha; moutarde chinoise, 1,5 t/ha; et moutarde blanche, 1,3 t/ha. La qualité variait entre la classe Canada n^{o} 1 pour la moutarde brune, la classe Échantillon - Grains pour la moutarde chinoise et la classe Canada n^{o} 4 pour la moutarde jaune.

INTRODUCTION: Cash crop grain growers in N.B. need an alternate high valued grain crop to grow in rotation with potatoes. The traditionally grown crops, wheat, oats, and barley produce high yields, improve soil structure and break disease and insect cycles but the return per acre is very low because of the very low price per tonne.

The N.B. Dept. of Agriculture has evaluated many alternate crops in an attempt to find one that had all the rotational benefits of grain (in a potato rotation) but with a much higher return per acre. The mustards, yellow, brown, and oriental are the latest crops to be evaluated for production potential. Mustard has many advantages: a high return per acre, a similiar growing season and equipment requirements as grain. In addition there are indications the high glucosinalate crops such as broccoli and mustard have some natural soil fumigant properties when crop residue is ploughed down.

The objective of this project was to determine the production potential of mustard in N.B. evaluating yield, quality parameters, agronomic characteristics such as lodging and disease resistance, and days to maturity. Nematode populations will be monitored both before planting and after harvest.

MATERIALS AND METHODS: Three mustards were planted at Hartland on May 14 in a R.C.B. design with four replications. Row spacing was 12 cm and the seeding rate was 5 kg/ha. Individual plot size was 2 X 8 m. Prior to planting, 150 kg/ha of 17-17-17 was broadcast and incorporated. Muster (22.5 g ai/ha) and Agral 90 (0.2 % v/v) was applied with a small plot sprayer post emergence. A soil sample was collected before planting and after harvest to determine nematode population. All plots were harvested on Sept. 3 with a Hege 140 plot combine.

RESULTS AND DISCUSSION: Yields of the brown, oriental, and yellow mustards ranged from 1.5, 1.5 to 1.3 T/ha resp. (Table 1). Quality was variable ranging from Canada No. 1 for brown, sample account for oriental, and Canada No. 4 for yellow

This is the first year that mustards have been evaluated, therefore there is no N.B. data to make comparisons with; however, if we compare the yield and quality of mustards to the canola trials, both parameters are well within the range of acceptable limits (Walker and Smith, 1991).

Other characteristics observed but not documented included disease and insect pests, days to maturity, lodging, and harvest ability. Non of these characteristics were a concern suggesting that mustards could be successfully grown in N.B.

Lab results indicating nematode populations were not available at time of publication.

CONCLUSIONS: Preliminary conclusions suggest that all three types of mustard could be commercially grown in N.B. A further 2 years of evaluation are necessary to expose the mustard crop to the variabilities of the N.B. climate. Further evaluation will be undertaken in 1992 and 1993.

ACKNOWLEDGEMENTS: The authors wish to express thanks to Gerald and Alvin Springer for plot land and to summer staff Charles Turner, Jennifer Eckstein, Angela MacFarlane, and Gary Leroux.

REFERENCES: Walker, D.F. and Smith, A.O.M. 1991. Spring Canola Cultivar Study - Hartland. Adaptive Research Reports, N.B. Dept. of Agriculture. 13:

TABLE 1: Yield and Grade of Spring Mustard Evaluation Hartland 1991

Cultivar	Class	Yield (T/ha)	Grade *
C. Brown	Brown	1.5 a	1
Breeder Cutlass	Oriental	1.5 a	SA
Ochre	Yellow	1.3 b	4
LSD (0.05)	-	0.1	-
C.V. (%)	-	5.4	-

117 days to maturity for all Cultivars

* Grade 1 - Canada No. 1
2 - Canada No. 2
3 - Canada No. 3
4 - Canada No. 4
SA - Sample Account

OAT AND HULL-LESS OAT CULTIVAR EVALUATION STUDY SUSSEX, GRAND FALLS AND BATHURST 1991

D.F. Walker and A.O.M. Smith

ABSTRACT: Yield of oat/hull-less oat cultivars/lines ranged from 4.5 - 2.8, 4.0 - 2.7 and 2.4 - 1.5 T/ha at Sussex, Grand Falls. and Bathurst respectively. Lodging did not occur on any plot at any location. Diseases did not affect yields at any site in 1991 due to lack of precipitation during the growing season. Yield differences between sites were due to planting date and fertility.

ÉVALUATION DE CULTIVARS D'AVOINE ET DE VARIÉTÉS D'AVOINE À GRAINS NUS SUSSEX, GRAND-SAULT ET BATHURST 1991

D.F. Walker et A.O.M. Smith

RÉSUMÉ : Le rendement des cultivars d'avoine et de variétés d'avoine à grains nus variaient entre 4,5 et 2,8 t/ha à Sussex, 4,0 et 2,7 t/ha à Grand-Sault et 2,4 et 1,5 t/ha à Bathurst. On n'a pas constaté de verse de l'avoine à aucun de ces endroits. Les maladies n'ont pas influé sur les rendements dans les trois endroits en raison des faibles précipitations durant la saison de croissance en 1991. Les écarts entre les endroits découlaient de la fertilité du sol et de la date de plantation.

INTRODUCTION: Cultivar evaluation and adaptation trials are a labour intensive routine component of any cereal research program. The main objective of any cultivar testing program is to (a) select the highest yielding and agronomically suitable line or cultivar for a given region and (b) to demonstrate these new cultivars or lines to the producers that will eventually grow them. The Field Crop section of N.B. Dept. of Agriculture regards this activity as a high priority. It is only through growing the highest yielding and most agronomically suitable cultivar that farmers in N.B. can stay competitive and make a profit.

Historically, oats have been by far the most widely grown crop in N.B. This was due to the ability of the oat crop to stand stressful conditions such as low pH, poor drainage, low fertility and delayed seeding dates. In the past ten years oat acreage has declined to the point where it now ranks second to barley which has become the choice of many grain farmers due to its higher yield potential and its ability to respond to higher levels of management. Even though oat acreage has declined, it is and will continue to be a very important grain crop in N.B.

The newest development has been the production of the hull-less oat lines from the Ottawa breeding program. Dr. Vern Burrows has spent many years developing and improving hull-less lines and we are now seeing the fruits of his labour.

The newest hull-less oat lines: Lotta(NO 820-3), OA 826-3(AC Hill), OA 825-1(AC Percy), and OA 825-3 are an improvement over Tibor and in some trials had yields approaching the lowest yielding normal hulled oats. The high feed value and recent yield increases of these latest hull-less oat lines could encourage livestock producers to switch to hull-less oats as feed grains.

MATERIALS AND METHODS: Nine normal/hull-less oat cultivars were planted at Sussex, Grand Falls, and Bathurst on April 30, May 15, and May 22 resp. A Wintersteiger plot seeder with 12 cm row spacing was used to plant the seed in 2 X 8 m plots. The seeding rate was 350 vk/m^2 and plot design was R.C.B. with four replications. The plot site at Sussex and Bathurst received a broadcast application of 250 kg/ha of 17-17-17 that was incorporated prior to planting. At Grand Falls, 200 kg/ha of 17-17-17 was broadcast and incorporated. An additional 150 kg/ha of 34-0-0 was broadcasted on all plots at G.S. 31. Blagal (840 g ai/ha), Tilt (125 g ai/ha), and Cycocel (200 g ai/ha) were applied to all plots, at all locations, as a tank mixture at G.S. 21 with a small plot sprayer. A Hege 140 plot combine was used to harvest the plots on Aug. 15, 29, and 30 at Sussex, Grand Falls, and Bathurst resp.

RESULTS AND DISCUSSION: The four recommended normal oat cultivars: Marion, Nova, Capital and Donegal (TO85025) had yields ranging from 4.5 - 4.2, 4.0-3.8, and 2.4-2.1 T/ha at Sussex, Grand Falls and Bathurst respectively (Table 1, 2, 3). There was no significant yield difference between any of the normal oat cultivars at any location. Yields were lower at Bathurst due to delayed planting and low soil fertility (Table 3). The Bathurst site was on newly reclaimed land. The other two sites were in a high fertility forage rotation at Sussex and a potato rotation at Grand Falls.

Precipitation levels were lower than normal during the growing season. This resulted in shorter than normal plant heights. As a result, no lodging was observed at any plot location.

The four hull-less lines had yields ranging from 3.3 - 2.8, 3.0 - 2.7, and 1.8 - 1.5 T/ha at Sussex, Grand Falls, and Bathurst respectively (Tables 1, 2, 3). At all three sites, the normal oats out-yielded the hull-less oats (Tables 1, 2, 3). However, The lowest yielding normal oat was only marginally better than the highest yielding hull-less line (Tables 1, 2, 3).

These obvious yield gains indicate good progress in breeding improved hull-less lines. If these yield advances continue, hull-less oats could become a viable option for grain growers in N.B.

On land not suitable for barley production, (ie; poor drainage, low pH, low fertility, etc.) and where a high quality grain product is required, hull-less oats would be the best option.

CONCLUSIONS: The normal oat cultivars continue to out-yield the latest hull-less lines; however, yield differences are only marginally better. The highest yielding hull-less lines look promising and will be an option for those producers wanting a high quality livestock feed from marginal land where wheat and barley can not be economically produced.

ACKNOWLEDGEMENTS: The authors wish to thank Stephen Moffet of Sussex, Baron Tepper of Grand Falls and Rod Archibald of Bathurst for plot land and summer students Charles Turner, Jennifer Eckstein, Angela MacFarlane and Gary Leroux.

TABLE 1: Yield and Agronomic Characteristics of Oat and Hull-less Oat Cultivars - Sussex 1991

Cultivar	Yield (T/ha)	Plant Height (cm)	Head Pop/m^2
Marion	4.5 a	94.8 c	353.0 a
Nova	4.4 a	91.3 c	287.0 cd
Capital	4.3 a	82.5 d	339.0 abc
Donegal	4.2 a	91.8 c	348.0 ab
Lotta 1 *	3.3 b	95.3 c	315.0 abcd
Lotta 2 *	3.2 bc	96.5 c	296.0 bcd
NO 826-3 *	3.0 bcd	104.8 b	285.0 cd
NO 825-1 *	2.8 cd	114.0 a	306.0 abcd
NO 825-3 *	2.8 d	107.0 ab	283.0 d
LSD (0.05)	0.4	7.6	55.1
C.V. (%)	8.3	5.4	12.1

* Hull-less

TABLE 2: Yield and TKW of Oat and Hull-less Oat Cultivars - Grand Falls 1991

Cultivar	Yield (T/ha)	TKW (g)
Capital	4.0 a	31.4 c
Nova	4.0 a	33.7 b
Donegal	4.0 a	35.5 ab
Marion	3.8 a	37.1 a
Lotta 2 *	3.0 b	29.0 de
NO 826-3 *	2.8 b	30.5 cd
Lotta 1 *	2.8 b	28.0 e
OA 825-3 *	2.8 b	34.4 b
NO 825-1 *	2.7 b	36.9 a
LSD (0.05)	0.4	2.3
C.V. (%)	8.5	4.7

* Hull-less

TABLE 3: Yield and TKW of Oat and Hull-less Oat Cultivars - Bathurst 1991

Cultivar	Yield (T/ha)	TKW (g)
Donegal	2.4 a	28.7 abc
Nova	2.4 a	26.7 bcd
Marion	2.2 ab	29.4 ab
Capital	2.1 abc	25.1 d
OA 825-3 *	1.8 bcd	28.7 abc
NO 825-1 *	1.7 cd	30.2 a
Lotta 1 *	1.6 d	25.1 d
Lotta 2 *	1.6 d	24.9 d
NO 826-3 *	1.5 d	25.9 cd
LSD (0.05)	0.5	3.2
C.V. (%)	16.6	8.0

* Hull-less

EVALUATION OF SPRING WHEAT, OAT & HULL-LESS OAT AND BARLEY CULTIVARS UNDER A SUSTAINABLE PRODUCTION PROTOCOL WOODSTOCK N.B. 1991

D.F. Walker & A.O.M. Smith

ABSTRACT: Five wheat, five oat and four barley cultivars were planted in separate trials in a R.C.B. design with three replications at Woodstock N.B. on May 31, 1991. Yields of wheat, oats and barley cultivars ranged from 2.0 - 1.5, 3.8 - 2.6 and 3.2 - 2.2 T/ha respectively. Lodging did not occur in any wheat or oat plots but all barley plots were lodged. Soil tests, to a depth of 45 cms. were taken at planting to determine nitrogen availability. Test results indicated that there was a total of 183.0 kg/ha available in both the NH_4 and NH_3 forms.

ÉVALUATION EN VERTU D'UN PROTOCOLE DE PRODUCTION VIABLE DES CULTIVARS DE BLÉ DE PRINTEMPS, D'AVOINE, D'ORGE ET DE VARIÉTÉS D'AVOINE À GRAINS NUS WOODSTOCK (N.-B.) 1991

D.F. Walker et A.O.M. Smith

RÉSUMÉ : En 1991, on a planté dans des essais séparés cinq cultivars de blé, cinq cultivars d'avoine et quatre cultivars d'orge dans un plan expérimental en blocs aléatoires complets et répété trois fois à Woodstock, au Nouveau-Brunswick. On a obtenu des rendements qui variaient entre 2 et 1,5 t/ha pour le blé; 3,8 et 2,6 t/ha pour l'avoine; et 3,2 et 2,2 t/ha pour l'orge. On n'a pas constaté de verse du blé ni de l'avoine, mais toutes les parcelles d'orge étaient versées. On a prélevé des échantillons du sol à une profondeur de 45 centimètres à la plantation afin de déterminer le niveau d'azote disponible. Les résultats des essais ont révélé un total de 183 kg/ha disponible à la fois sous la forme NH_4 et sous la forme NH_3.

INTRODUCTION: Interest in sustainable agriculture is continuing to expand as a result of increased awareness and concern about chemicals in the food supply. Sustainable methods of production do not permit the use of synthetic fertilizers, herbicides, insecticides, fungicides or growth regulators. They rely mainly on crop rotation, natural soil mineralization, the application of manures and natural fertility sources for plant nutrition. Crop damage from diseases and insect pests is avoided mainly through genetic resistance and the avoidance of monoculture crop production. Yields from organic production systems are usually lower than the more conventional systems, however, cost of production is usually lower and consumers are prepared to pay more for certified organically grown crops. Cosmetic appeal of organically produced crops is usually less than conventionally produced crops, but consumers will overlook some disease and insect damage if they know that the crops were organically grown. The purpose of this project was to determine the production potential of spring wheat, oat and barley cultivars when grown under an organic protocol.

MATERIALS AND METHODS: On May 31, a Wintersteiger plot seeder was used to plant a wheat, barley, and oat & hull-less oat cultivar study at Woodstock, N.B. The seeding rate was 350 viable kernels per meter squared with a row spacing of 12 cm. Plot design was R.C.B. with three replications and plot size was 2 X 8.0m. All plots were underseeded with red clover (9 kg/ha) and managed according to organic protocol: no commercial fertilizers, herbicides, insecticides, fungicides, growth regulators or seed treatments were applied to the seed or growing crop. All plots were harvested on Sept. 3 with a Hege 140 plot combine. Table 1 is a soil analysis report from a sample that was collected prior to planting.

RESULTS & DISCUSSION: Yields of all three species in 1991 were 3-4 times higher than yields at the same location planted on June 1, 1990 (Walker and Smith, 1990). The excellent yields of 1991 were a result of relatively low disease pressure during most of the growing season. The lack of disease pressure can be attributed to very low rain fall through June, July and early August. Normally, grain seeded later than May 20th suffer severe yield losses due to heavy disease and insect pressure. Planting date was unavoidably delayed due to difficultly in having land prepared and availability of seeding equipment.

Five wheat cultivars: AW153, Baltic, Belvedere, Katepwa and Punjab 85 had yields ranging from 2.0 to 1.5 T/ha (Table 2). Considering the level of management and late planting date, these yields were very acceptable. Of all the species in the study, wheat, oats and barley, wheat experienced the most disease pressure which could explain why the wheat yields, on average, were lower than that of the other two species. The new line, AW 153, continues to show high yield potential. Visual observations at harvest suggest that low head populations, reduced kernel number per head, and low TKW's were responsible for low yields.

Yields of the 4 normal and 1 hull-less oat cultivars, ranged from 3.8 to 2.6 T/ha (Table 3). These are excellent yields considering the late planting date and the absence of fertilizer and weed control. As in 1990, oats appear to be best suited to low input production (Walker and Smith, 1990).

The four barley cultivars: Robust, Chapais, Leger and Morrison also had very good yields ranging from 3.2 to 2.2 T/ha respectively (Table 4). There was no significant yield difference across varieties; however, the American variety, Robust, expressed good yield potential similar to the most widely grown Canadian variety, Chapais. The once dominant variety, Leger, had a lower yield followed by the only two-row variety in the test, Morrison (Table 4).

The time interval from planting to harvest was only 96 days, much shorter than that normally required for oats and wheat (104 and 110 days respectively). The wheat and oats were harvested at the ideal time and did not experience lodging. Barley, the earlier maturing species than both wheat and oats, was mature earlier; however, harvest was unavoidably delayed which could have resulted in the lodging of all plots.

Soil results from the top 45 cm. indicate that at time of planting there was approximately 183.0 kg/ha of nitrogen available for plant growth (Table 1). This level of nitrogen plus any provided from the underseeded red clover suggests that nitrogen was not limiting at this location in 1991. The underseeded red clover did not cause a problem at harvest, in fact, it helped support the lodged barley, reducing harvest loss.

This is a four year crop rotation project involving red clover for two years followed by potatoes and grain underseeded to red clover. The red clover is used as a cover crop only.

CONCLUSIONS: Despite the very late planting date, yields on all three species were very high. This was due partially to the lack of disease pressure and the availability of adequate soil nitrogen. This experiment will be continued in 1992 to further evaluate species and cultivars with species that could be adapted to the sustainable method of production.

REFERENCES: Walker, D.F. and Smith, A.O.M. 1990. Evaluation of Triticale/Wheat, Barley and Oat Cultivars Under A Sustainable Production Protocol - Woodstock. N.B. Adaptive Research Reports 12, 132-135.

ACKNOWLEDGEMENTS: The author wishes to thank Mack and Dwayne White for plot land used for this study.

TABLE 1: Soil Nitrogen Test Results at Three Soil Depths
Woodstock 1991

Depth (cm.)	NH_4-N (ppm)	NH_4-N (Kg/ha)	NO_3-N (ppm)	NO_3-N (Kg/ha)	Total(Kg/ha) NH_4-N + NO_3-N
0 - 15	8.6	17.2	25.1	50.2	67.4
15 - 30	9.9	19.8	20.8	41.6	61.4
30 - 45	6.7	13.4	20.4	40.8	54.2
Total	25.2	50.4	66.3	132.6	183.0

TABLE 2: Yield of Spring Wheat Under a Sustainable Production Protocol - Woodstock 1991

Cultivar	Yield (T/ha)
AW 153	2.0 a
Baltic	1.9 a
Belvedere	1.8 ab
Katepwa	1.5 bc
Punjab 85	1.5 c
LSD (0.05)	0.4
C.V. (%)	11.3

TABLE 3: Yield, TKW and Lodging of Oat and Hull-less Oat Cultivars Under a Sustainable Production Protocol Woodstock 1991

Cultivar	Yield (T/ha)	TKW (g)	Lodging* (0-9)
TO 85025	3.8 a	38.9 a	4 b
Marion	3.8 a	35.3 b	8 c
Capital	3.8 a	32.8 c	0 a
Nova	3.2 ab	32.6 c	4 b
Lotta	2.6 b	29.5 d	1 a
LSD (0.05)	0.8	2.3	3
C.V. (%)	13.1	3.7	45.6

* Harvest lodging

TABLE 4: Yield and TKW of Barley Under a Sustainable Production Protocol - Woodstock 1991

Cultivar	Yield (T/ha)*	TKW (g)
Robust	3.2 a	35.4 b
Chapais	3.2 a	42.0 a
Leger	2.9 a	35.1 b
Morrison	2.2 a	37.3 ab
LSD (0.05)	1.3	4.8
C.V. (%)	23.3	7.4

* Uniform lodging due to delayed harvest

SPRING WHEAT CULTIVAR EVALUATION
SUSSEX, GRAND FALLS AND BATHURST 1991

D.F. Walker & A.O.M. Smith

ABSTRACT: Wheat yields ranged from 3.9 - 3.3, 3.9 - 2.8, and 2.8 - 1.6 T/ha for Sussex, Grand Falls and Bathurst respectively. Lodging did not occur at any site. Plant heights at the Sussex location were very short ranging from 78.5 - 61.8 cm. The two recommended cultivars, Baltic and Belvedere, continued to perform very well.

ÉVALUATION DES CULTIVARS DE BLÉ DE PRINTEMPS
SUSSEX, GRAND-SAULT ET BATHURST 1991

D.F. Walker et A.O.M. Smith

RÉSUMÉ : On a obtenu des rendements qui variaient entre 3,9 et 3,3 t/ha à Sussex, 3,9 et 2,8 t/ha à Grand-Sault et 2,8 et 1,6 t/ha à Bathurst. Aucun des endroits n'a signalé de verse du blé. La hauteur des plants, qui était très courte à Sussex, variait entre 61,8 et 78,5 cm. Les deux cultivars recommandés, Baltic et Belvedère, ont continué à donner de très bons rendements.

INTRODUCTION: Cultivar evaluation and adaptation trials are a labour intensive routine component of any cereal research program. The main objective of any cultivar testing program is to (a) select the highest yielding and agronomically suitable line or cultivar for a given region and (b) to demonstrate these new cultivars or lines to the producers that will eventually grow them. The Field Crop section of the N.B. Dept. of Agriculture regards this activity as a high priority. It is only through growing the highest yielding and most agronomically suitable cultivar that farmers in N.B. can stay competitive and make a profit.

In N.B. in excess of 90% of all grain produced is used for feeding livestock and the remainder is used for seed. Of the three principal small grain crops grown, wheat, oats and barley, wheat occupies the smallest area, fluctuating between seven and ten thousand acres.

The Charlottetown wheat breeding program has in the past and continues to supply the most widely adapted cultivars for N.B. conditions. The two latest cultivars, Baltic and Belvedere, have the attributes of high yield, disease and lodging resistance required for N.B. growing conditions.

MATERIALS AND METHODS: Ten spring wheat cultivars were planted at Sussex, Grand Falls, and Bathurst on April 30, May 21, and May 22 resp. A Wintersteiger plot seeder with 12 cm row spacing was used to plant the seed in 2 X 8 m plots. The seeding rate was 350 vk/m^2 and plot design was R.C.B. with four replications. The plot site at Sussex and Bathurst received a broadcast application of 250 kg/ha of 17-17-17 that was incorporated prior to planting. At Grand Falls, 200 kg/ha of 17-17-17 was broadcast and incorporated. An additional 150 kg/ha of 34-0-0 was broadcasted on all plots at Sussex at G.S. 31. All plots at Grand Falls and Bathurst received an additional application of 180 kg/ha of 34-0-0 at G.S. 31. Blagal (840 g ai/ha), Tilt (125 g ai/ha), and Cycocel (200 g ai/ha) were applied to all plots, at all locations as a tank mixture at G.S. 21 with a small plot sprayer. A Hege 140 plot combine was used to harvest the plots on Aug. 15, 29, and 30 at Sussex, Grand Falls, and Bathurst resp.

RESULTS AND DISCUSSION: Wheat yields ranged from 3.9 - 3.3, 3.9 - 2.8, and 2.8 - 1.6 T/ha for Sussex, Grand Falls and Bathurst respectively (Table 1, 2, 3). The two recommended cultivars, Baltic and Belvedere, had the highest yields at both Sussex and Grand Falls (Table 1,2). At the Bathurst site, yields were lower, but not significantly lower than the highest yielding cultivar (Table 3).

The AW lines: 194, 153 and 155, have lower yields than Baltic and Belvedere but do have some yield potential and will require further testing (Table 1,2,3). The Punjab 85 line produced very high yields in 1990 but in 1991 it was the lowest yielding cultivar in all three tests (Preliminary Cereal Variety Trials, 1990). The newly licensed cultivar Heather (FRH 17-77-2) had the highest yield at Bathurst but ranked mid-way at the other two locations. This cultivar does not appear to have the yield potential of Baltic or Belvedere. Tests are under way to determine if Heather has milling quality. The three other lines, Hege 770-87, SH 88-2206, and SH 88-2153 had low yields and therefore little production potential in N.B (Table 1,2,3).

Lodging did not occur on any plots at any location. The normal length of growing season for spring wheat in N.B. is 110 - 112 days. At the Sussex and Grand Falls locations, cultivars were mature at 107 and 106 days respectively, 5 - 7 days ahead of normal. Commercial grain growers also noted that the growing season for all small grain crops in 1991 was shorter than normal. It appears that climate change (higher temperatures during the growing season) or some other environmental condition is shortening the growing season required to produce small grains in N.B.

Visual observations made during the growing season and at harvest confirm that disease levels were very low at all three plot locations in 1991. In the past several years Fusarium infection has been very heavy on spring wheat. In 1991, there were no visible symptoms of fusarium head blight on any cultivar at any location.

CONCLUSIONS: The recommended cultivars continue to produce very good yields out-yielding all entries at two of the three locations. The AW lines from the Charlottetowm breeding program suggest some yield potential and will be evaluated again in 1992. Disease and lodging pressure were very low in 1991 and therefore difficult to determine which varieties had the greatest disease resistance or strongest straw.

ACKNOWLEDGEMENTS: The authors wish to thank Stephen Moffet of Sussex, Baron Tepper of Grand Falls and Rod Archibald of Bathurst for plot land. Appreciation is also extended to summer staff Charles Turner, Jennifer Eckstein, Angela MacFarlane, and Gary Leroux.

REFERENCES: Preliminary Cereal Variety Trials 1990. Conducted by Atlantic Advisory Committee of Cereal and Protein Crops

TABLE 1: Yield and Agronomic Characteristics of Spring Wheat Cultivars - Sussex 1991

Cultivar	Yield (T/ha)	Plant Height (cm)	Head Population (m^2)
Baltic	3.9 a	72.5 cd	397.0 abcd
Belvedere	3.9 ab	74.0 bc	352.0 cd
Hege 770-87	3.9 ab	75.5 abc	399.0 abcd
SH 88-2206	3.8 abc	63.0 e	463.0 ab
AW 155	3.8 abc	74.0 bc	429.0 abc
FRH 17-77-2	3.7 abcd	70.8 d	458.0 ab
AW 194	3.7 abcd	78.5 a	325.0 d
AW 153	3.6 bcd	76.5 ab	391.0 bcd
SH 88-2153	3.6 cde	64.0 e	493.0 a
Hege 770-87	3.4 de	75.8 ab	454.0 ab
Punjab 85	3.3 e	61.8 e	399.0 abcd
LSD (.05)	0.3	3.2	96.5
C.V. (%)	4.9	3.1	16.1

TABLE 2: Yield and TKW of Spring Wheat Cultivars
Grand Falls - 1991

Cultivar	Yield (T/ha)	TKW (g)
Belvedere	3.9 a	35.5 bc
Baltic	3.6 ab	33.6 d
AW 194	3.6 ab	37.2 a
AW 153	3.4 abc	34.6 cd
AW 155	3.4 abc	36.4 ab
FRH 17-77-2	3.4 abcd	31.2 e
Hege 770-87	3.2 bcde	32.2 e
SH 88-2206	2.9 cde	31.4 e
SH 88-2153	2.9 de	31.2 e
Punjab 85	2.8 e	36.5 ab
LSD (0.05)	0.5	1.3
C.V. (%)	10.9	2.6

TABLE 3: Yield and TKW of Spring Wheat Cultivars
Bathurst - 1991

Cultivar	Yield (T/ha)	TKW (g)
FRH 17-77-2	2.8 a	28.0 efg
AW 153	2.8 a	32.5 abc
AW 155	2.7 a	34.2 a
Belvedere	2.7 a	30.9 bcd
AW 194	2.6 a	33.2 ab
Baltic	2.6 a	29.7 def
Hege 770-87	2.4 ab	30.3 cde
SH 88-2153	1.8 bc	26.9 g
SH 88-2206	1.7 c	27.6 fg
Punjab 85	1.6 c	32.1 abcd
LSD (0.05)	0.6	2.5
C.V. (%)	18.3	5.8

VERTICILLIUM WILT RESISTANT ALFALFA VARIETY EVALUATION

C.H. McLean, A.O.M. Smith and L.M. Nason

ABSTRACT: Ten on-farm demonstrations were established throughout New Brunswick to assess the resistance to Verticillium Wilt and persistence of eighteen varieties. Stands will be monitored for disease level in 1992.

ÉVALUATION D'UNE VARIÉTÉ DE LUZERNE RÉSISTANTE À LA FLÉTRISSURE VERTICILLIENNE

C.H. McLean, A.O.M. Smith et L.M. Nason

RÉSUMÉ : On a organisé dix projets dans des fermes partout au Nouveau-Brunswick afin d'évaluer la résistance à la flétrissure verticillienne et l'endurance de dix-huit variétés de luzerne. On évaluera en 1992 la résistance des peuplements à la maladie.

INTRODUCTION: Verticillium wilt is one of the most potentially destructive diseases of alfalfa. It is widespread throughout the major seed producing areas of the northwestern United States. It was first identified on farms in Western Canada in 1976 and has spread rapidly since that time. A survey conducted in 1980-81 detected the disease in British Columbia, Alberta, Saskatchewan, Ontario, and Nova Scotia. Measures such as seed treatment and certification of seed lots, aimed at preventing introduction of the disease into new areas, appeared effective. In 1986, federal regulations requiring seed treatment of alfalfa were removed. In 1988, surveys in New Brunswick, Prince Edward Island and Nova Scotia identified the disease in many locations.

Verticillium wilt of alfalfa is caused by the fungus Verticillium albo-atrum. Different strains of Verticillium attack other crops such as potatoes and strawberries, but these strains do not affect alfalfa.

The most effective means of combatting Verticillium Wilt is to plant varieties with resistance to the disease. At the time of outbreak in N.B., none of the varieties recommended in the region had adequate resistance.

A project was undertaken to determine the adaptability of improved varieties with varying degrees of verticillium wilt resistance. Large scale plots were established on several farms throughout the province in 1989, 1990, and 1990. A total of eighteen varieties were demonstrated on farms, with individual sites demonstrating three to eight varieties each.

MATERIALS AND METHODS: Seed of a total of eighteen varieties was distributed to ten farms throughout the province in the springs of 1989, 1990, and 1991. Individual farmers established from three to eight varieties, with the sites ranging from three to six hectares in size.

Table 1 lists the varieties demonstrated on farm, including newer varieties with verticillium wilt resistance, and older varieties for comparison purposes. These sites will be monitored in 1992 for persistence and disease levels.

Table 2 indicates the locations and year of establishment of the on-farm demonstrations. Farmers interested in viewing these varieties under field conditions should contact the grower involved.

TABLE 1: Alfalfa Varieties Demonstrated

1. Algonquin	10. Pioneer 5311
2. Ambassador	11. Pioneer 5432
3. Apica	12. Saranac
4. Arrow	13. Sparta
5. Centurion	14. Surpass
6. DK 125	15. Tomahawk
7. Iroquois	16. Ultra
8. Minto	17. Verta Plus
9. Oneida VR	18. WL 316

TABLE 2: On Farm Demonstrations

Name	Location	Establishment Year
Garnet Donnelly	Lake George	1989
Gerrit Groenenberg	Hoyt	1989
Roy McCullum	Sussex	1989
Mike Mullen	Moncton	1989
Pierre Laviolette	Charlo	1989
Patrick Riordan	Pokeshaw	1989
Lamarche & Furlotte	St. Quentin	1989
Joe Connors	Scoudouc	1990
Bonar Morton	Rexton	1991
Joe Brennan	Johnville	1991
George Lawrence	Burtts Corner	1991
Jim Wheaton	Point de Butte	1991
Alan Prescott	Middle Sackville	1991
Sussexview Farms	Sussex	1991
Valleyview Farms	Norton	1991
Cajetan DuPéré	St. Quentin	1991

CONCLUSIONS: No significant infestation of Verticillium Wilt was noted in 1990 or 1991. Individual demonstration sites will be monitored in 1992 to evaluate disease level and persistence.

EFFECT OF NITROGEN ON REED CANARYGRASS

C.H. McLean, A.O.M. Smith and L.M. Nason

ABSTRACT: Increased nitrogen levels on Venture and Palaton reed canarygrass varieties, resulted in increased dry matter yields and crude protein yields. No significant difference was observed between varieties.

EFFETS DE L'AZOTE SUR L'ALPISTE ROSEAU

C.H. McLean, A.O.M. Smith et L.M. Nason

RÉSUMÉ : L'augmentation des niveaux d'azote sur les variétés Venture et Palaton a entraîné une hausse des rendements en matière sèche et en protéine brute. On n'a pas observé d'écart important dans les résultats obtenus pour les différentes variétés de l'alpiste roseau.

INTRODUCTION: Reed canarygrass (Phalaris arundinacea) has long been recognized as a vigorous species with considerable growth potential, but has met with limited acceptance due to certain anti-quality characteristics. Older varieties had high alkaloid levels, which decreased palatability and animal performance. Interest in the production of reed canarygrass has increased in recent years with the introduction of new cultivars.

Because of its tolerance of wet soil conditions, reed canarygrass has traditionally been grown on poorly drained soils. Although the crop thrives under these conditions it is often difficult or impossible to harvest or graze the plants at the proper time.

To better evaluate the potential of the species, a trial was established in Grand Falls to assess the response of two varieties of reed canarygrass to various levels of nitrogen fertility.

MATERIALS AND METHODS: Two reed canary grass cultivars, Venture and Palaton, were seeded at Grand Falls, N.B. on June 5, 1989 at 12 kg/ha, in a split plot design with 4 replications using a Wintersteiger plot seeder. Each sub-plot measured 2 X 8.5m. On June 20, 1989 an application of 15-15-15 was broadcast at 400 kg/ha. During the first year, the plots were clipped for weed control with no yield data taken.

During 1990, fertilizer was applied according to soil analysis. Three applications of the nitrogen fertility treatments were applied as amonium nitrate. Three harvests, using a flail type plot harvester, were taken and a standard lab analysis done for each harvest with yield and analysis data recorded.

On May 23, 1991 an application of 0-46-60 at 425 kg/ha was broadcast on the plots with a cyclone hand spreader. Nitrogen was applied as ammonium nitrate at 0, 20, 40, and 60 kg actual N/ha on May 23, June 13, and July 26. Three harvests (June 12, July 25, and Oct. 20) were taken during 1991 using a Rem, flail type harvester. Yield of each sub-plot was determined, and sub-samples were submitted for laboratory analyses.

RESULTS AND DISCUSSION: Extremely dry summer conditions resulted in low overall yields in 1991. Dry matter yields for the total of three cuts are presented in Table 1. No significant difference between varieties was observed. Differences were observed among nitrogen levels for each variety, and for the mean of both varieties at different levels of nitrogen.

The same effects were determined in crude protein yield, as shown in Table 2. Again no difference was detected between varieties.

These data show that current varieties of reed canarygrass respond well to nitrogen fertility, and that crude protein percentage and yield are acceptable under proper management.

TABLE 1: Effect of Nitrogen on Total Dry Matter Yield of Reed Canarygrass (kg/ha) *

Variety	kg actual N/ha per application				Variety Mean
	0	20	40	60	
Venture	1100^{D}	1950^{C}	2860^{B}	3940^{A}	$2462^{N.S.}$
Palaton	1240^{D}	1902^{C}	2930^{B}	4046^{A}	$2529^{N.S.}$
N Means	1170^{D}	1924^{C}	2895^{B}	3990^{A}	

L.S.D.	(.05)
Between variety means	N.S.
Between nitrogen means	312
Between nitrogen means for same variety	411
Between variety means for same nitrogen level	N.S.

* Values followed by the same letter are not significantly different.

TABLE 2: Effect of Nitrogen on Total Crude Protein Yield of Reed Canarygrass (kg/ha) *

Variety	kg actual N/ha per application				Variety Means
	0	20	40	60	
Venture	164.2^{A}	308.3^{B}	466.7^{B}	656.1^{C}	398.8$^{N.S.}$
Palaton	183.4^{A}	289.3^{B}	476.0^{B}	693.8^{C}	410.6$^{N.S.}$
N Means	173.8^{A}	298.8^{B}	471.4^{B}	675.0^{C}	

L.S.D.	(.05)
Between variety means	N.S.
Between nitrogen means	59
Between nitrogen means for the same variety	95
Between variety means for the same nitrogen level	N.S.

* Values followed by the same letter are not significantly different.

CONCLUSIONS: The reed canarygrass varieties, Venture and Palaton, responded well to increased nitrogen inputs, although yield was limited by dry conditions in 1991. Increases in dry matter yield and crude protein yield were observed with higher levels of nitrogen, but no differences were observed between varieties.

Although adapted to poorly drained soils, this species provided adequate levels of high protein forage when grown on a well drained soil. Further analysis is needed to determine alkaloid levels of these cultivars under New Brunswick conditions. Grazing trials are required to determine the acceptability of the forage to livestock. The feasibility of growing reed canarygrass in mixtures with legumes also warrants investigation.

PEST MANAGEMENT - LUTTE ANTI-PARASITAIRE

PATHOGENICITY OF *Sydowia polyspora* ON THREE JUNIPER VARIETIES

Kelvin Lynch, Garth Nickerson and Margaret Mann

Abstract: *Sydowia polyspora* was unable to infect either non-injured or mechanically injured juniper leaves. *S. polyspora* did colonize and sporulate on cold-stress damaged leaves but did not spread beyond the freeze-damaged area. It seems unlikely that this fungus is an aggressive pathogen of non-predisposed tissues and its prevalence on damaged junipers in landscape settings is probably due to its ability to be a quick successful colonizer of damaged leaves resulting from cold stress or other causes. Apparent blights of juniper foliage can result from root rot and could be confused with damage resulting from above ground stresses. Immunoassay kits identified Phytophthora as the most likely candidate for the cause of root rot in this trial and they could possibly represent a useful detection tool for the landscape industry.

PATHOGÉNICITÉ DU *Sydowia polyspora* SUR TROIS VARIÉTÉS DE GENÉVRIERS

Kelvin Lynch, Garth Nickerson et Margaret Mann

RÉSUMÉ : On a constaté que le *Sydowia polyspora* ne s'attaque pas aux feuilles de genévrier non abîmées ou abîmées de façon mécanique. Le *Sydowia polyspora* s'installe en colonie et produit des spores sur les feuilles abîmées par le froid, mais seulement sur la partie abîmée. Il semble peu probable que ce champignon soit un fort agent pathogène de tissus non vulnérables. Sa prédominance sur des genévriers endommagés dans des aménagements paysagers est probablement imputable à sa capacité de s'installer rapidement en colonie sur les feuilles abîmées par le froid ou d'autres manières. Une brûlure apparente des feuilles du genévrier peut résulter de la carie des racines. Il est facile de se tromper et de penser que la cause de la brûlure est au-dessus du sol. Des trousses d'immuno-essai nous ont permis de constater que le pourridié phytophthoréen est la cause la plus probable de la carie des racines dans la présente expérience. Une telle trousse peut être un outil de détection utile à l'industrie de l'aménagement paysager.

Introduction: Junipers frequently develop browning and death of the foliage in the spring and early summer. *Phomopsis juniperovora* is frequently reported as the cause of this type of damage in more southern areas (Schoeneweiss, 1969) but has been found only rarely here, nevertheless it is common for growers to refer the problem as juniper blight. Blighted juniper branches in New Brunswick are colonized by different fungi but *S. polyspora* (anamorph = *Sclerophoma pythiophila*) is the fungus most frequently isolated. This fungus is considered to be a weak pathogen infecting only tissues that have been predisposed (Brener *et al*, 1974). Such factors in New Brunswick could include dehydration by winter winds, low winter temperatures, snow breakage, excess soil moisture and poor quality plant material.

This trial was carried out to evaluate the pathogenicity of *S. polyspora* on three selections of juniper using two different wounding techniques prior to inoculation. It was felt that it was worth while to examine the role of *S. polyspora* in juniper browning because of the extensive use of junipers in landscaping, the severity of the browning problem in some years and because occasionally it is possible to find this fungus causing lesions on foliage which do not fit the pattern of winter dehydration.

Materials and Methods: Two year old potted (6 litre) specimens of Juniper sabina var. tamariscifolia, J. sabina var. Arcadia, and J. chinensis var. Old Gold were purchased from a local nursery. The isolate of S. polyspora was collected from a local nursery which had extensive browning during the early summer of 1991. Twenty different isolations where made onto PDA media. All cultures appeared similar and a single spore was subcultured to fresh PDA and grown under UV light for 12 hours per day at 20 to 24 C. After four days PDA plugs were used to inoculate ten additional plates. After 14 days conidia were washed from these plates using a small amount of sterile water and by gently scraping with an "L" shaped glass rod. Final spore concentration was adjusted to 14,000 spores per ml and the suspension was kept on ice until used for inoculation several hours later.

The four treatments consisted of inoculated but non-wounded specimens, inoculated specimens following slight wounding with a scalpel blade, inoculated specimens following freezing with liquid nitrogen and freezing with liquid nitrogen without inoculation. For each variety five potted specimens received each treatment and each specimen was inoculated at ten sites (a total of 50 inoculations per treatment per variety). Healthy actively growing areas were chosen for the inoculation site.

For the cold stress damaged specimens the freezing was accomplished at the inoculation site by first immersing a cotton Q-Tip in liquid nitrogen and then placing it on the foliage until ice crystals where apparent in the tissue. The tissue was then thawed by touching with the finger and then the droplet of inoculum was placed on the site. The site for inoculation was a small leaf approximately 3 mm in diameter and the area which appeared to freeze was approximately 5 mm long. Inoculation sites were chosen so that if infection and colonization occurred the pathogen could readily spread basipetally into larger leaves causing greater damage then that caused by the wounding technique alone. Since the freezing alone would destroy the inoculated tissues it was decided that an infection would be considered successful only if it demonstrated this secondary spread.

Specimens were watered and misted prior to inoculation and immediately after they were covered with a black plastic bag and placed in a darkened room at 20 to 25 C. After five days the plastic was removed and the plants moved to a greenhouse where the foliage was kept wet by misting system and with temperatures of 21 to 27 C. All treatments were evaluated after four weeks.

Results and Discussion: No infection of non-injured tissues or tissues wounded with the scalpel occurred on any variety. There was no sporulation and no necrosis of the leaf tissues with these treatments. Freezing with liquid nitrogen did as expected cause tissue death. Combining the results for the three varieties this occurred 87 percent of the time for freezing followed by inoculation and 93 percent for freezing alone. S. polyspora sporulation was apparent on 67 percent of the sites which were frozen then inoculated and on 4 percent of the frozen but non-inoculated sites. Although the death of tissue at the freezing site was complete for both treatments causing browning of the tissues beyond this point in no case was there any evidence of spread into tissues not directly affected by the wounding. The apparent infection as shown by the zone of sporulation was approximately the same size as the area of tissue damaged by freezing. Although small differences did occur between the three varieties these where not considered significant since it was apparent that the freezing event itself was responsible for the damage and not S. polyspora.

Conclusions: From the results obtained in this experiment it is concluded that S. polyspora is at best a weak pathogen not capable of infecting healthy or mechanically wounded tissues. It is capable of colonizing and sporulating on freeze-damaged tissues but in this experiment it did not appear to move beyond this zone. This is based on the observation that there was not any tissue necrosis located basipetally from the point of infection.

That fact that 67 percent of freeze-wounded inoculated sites developed sporulation indicates that the inoculation technique was acceptable although temperatures would have been higher in this trial then would be experienced during spring and early summer in New Brunswick. Perhaps of more importance might be the growth stage of the juniper at the time of inoculation. In this trial young actively growing shoots were inoculated, it is possible that infection could occur in nature when tissues are dormant and therefore compartmentalization of the infection would be slower and the area damaged larger.

An interesting side note to this trial was the development of extensive necrosis in four of the J. sabina var. Arcadia specimens. This necrosis developed on individual main branches and mimicked somewhat the damage observed on junipers in natural settings observed under our conditions. Examination of the specimens revealed the cause of the necrosis to be root rot and not *S. polyspora*. It was felt that the specimens may have had a low level of root rot prior to inoculation and that the misting used to encourage infection by *S. polyspora* increased the severity of the root rot by maintaining saturated soil conditions. Testing with **Agri-Diagnostics Multiwell Immunoassay** kits; **Phytophthora E**, **Pythium C** and **Rhizoctonia** gave the following results.

Table 1: Absorbency Readings

	Absorbency		
	Phytophthora	Pythium	Rhizoctonia
Positive Control	1.542	1.243	1.117
Negative Control	0.054	0.040	0.075
Specimen 1	1.822	0.282	0.449
Specimen 2	1.046	0.423	0.077
Average	1.434	0.352	0.263

These tests for the detection of fungi are based on double-antibody "sandwich" enzyme immunoassay. Positive and negative controls are supplied by the manufacturer and it is by comparison to these absorbencies that the test results are interpreted. For the Rhizoctonia test Specimen 2 with an absorbency of 0.077 is essentially the same as the negative control and therefore the role of Rhizoctonia in the root rot is doubtful. The Pythium average absorbency of 0.352 is nearly 9 times the negative and therefore is considered positive however, it is still only 28 percent of the positive control. Perhaps the most interesting results are for the Phytophthora test with the average of 1.434 being 26 times greater than the negative control and equal to 93 percent of the absorbency of the positive control.

These results and the related symptoms indicate the importance of checking for root rot problems when examining foliage necrosis problems either in the nursery or landscape setting. The **Agri-Diagnostics Multiwell Immunoassay** kits may with some development work be a useful tool for nurseries screening for symptomatic and asymptomatic root rot problems which decrease productivity.

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BARLEY VARIETAL TOLERANCE TO DPX R9674(REFINE EXTRA)

K.V. McCully, D. Walker, M.A. Mann, and D.O. Hanscomb

ABSTRACT: A trial to evaluate DPX R9674 on Duke, Sabina, and Chapais barley varieties was conducted to determine if variety tolerance differences existed. MCPA amine was also applied as the standard treatment. Visual crop injury and weed control ratings were collected in addition to yields. Analysis of crop injury and yield data indicated that there were no significant tolerance differences between the three tested varieties when DPX R9674 or MCPA was applied. Weed pressure was light in the plots but both DPX R9674 and MCPA both provided excellent weed control.

TOLÉRANCE SELON LES VARIÉTÉS D'ORGE DU DPX R9674 (EXTRA-RAFFINÉ)

K.V. McCully, D. Walker, M.A. Mann et D.O. Hanscomb

RÉSUMÉ : On a procédé à des essais sur les variétés d'orge Duke, Sabina et Chapais afin de déterminer si leur tolérance du DPX R9674 était différente. Un traitement au MCPA-amine a également été appliqué à toutes les variétés. On a effectué des évaluations visuelles des dommages causés aux cultures, de la suppression des mauvaises herbes et des rendements. D'après les évaluations des dommages aux cultures et des rendements, il n'existe aucune différence marquée dans la tolérance de ces trois variétés en présence d'un traitement au DPX R9674 ou MCPA. La densité des mauvaises herbes était faible dans les parcelles, mais à la fois le DPX R9674 et le MCPA ont entraîné une excellente suppression des mauvaises herbes.

INTRODUCTION: A new herbicide, DPX R9674(Refine Extra), is currently being developed by Dupont Canada. It is a mixture of the currently registered Refine and the experimental DPX L5300 and is expected to be registered in the very near future. In order to generate data on the tolerance of various barley varieties to DPX R9674 a trial was established.

MATERIALS AND METHODS: Three barley varieties, Duke, Sabina and Chapais were planted April 30, 1991 in Sussex, Kings County. Soil type was a sandy loam with a pH of 5.9. Seeding rate was 355 seeds/m^2 and row spacing 12 cm. 250 kg/ha of 17-17-17 and 125 kg/ha of 34-00-00 fertilizers were applied. Experimental design was a randomized complete block in a split design with four replicates. Plot size was 2.5 x 8m. Previous crop was alfalfa. Post emergence herbicides (Table 1) were applied May 28 when barley varieties were at the 4-6 leaf stage. Herbicides were applied using a CO_2 handheld sprayer in a water volume of 150 L/ha at 207 kPa pressure. Rainfall levels were 26 mm seven days before application and 40 mm fourteen days after.

Visual assessments on crop phytotoxicity and weed control were taken June 11, June 25 and July 23. Yields were collected August 8. Analysis of variance was performed on data. Arcsin transformations were performed on the visual data where necessary. Yield was transformed using logs. Means were separated by Duncan's multiple range test.

RESULTS AND DISCUSSION:

Crop injury: Two weeks after application some initial low levels of injury (0-7.5%) was observed on the varieties (Table 1). By June 25 (28 days after application) however, no injury was observed from any treatment on any variety. Crop tolerance was therefore excellent from both MCPA and DPX R9674 on all three tested varieties.

Yields: There were no significant differences in yields when comparing MCPA, DPX R9674 + Agral 90 and the control on any of the varieties. Crop tolerance was therefore excellent.

Weed pressure: Weed pressure was very light in the trial area as the untreated control plots had very few weeds. Weeds observed at low densities in the trial included hempnettle, lambsquarter's, wild buckwheat, wormseed mustard and clovers. Throughout all the rating periods weed control from DPX R9674 + Agral 90 and MCPA was significantly higher than the control, but not from each other. Weed control for DPX R9674 + Agral 90 was over 95% by the last assessment date, and over 80% for MCPA.

CONCLUSIONS: There were no differences between the three varieties when evaluating crop tolerance from the experimental DPX R9674 + Agral 90 or the standard MCPA applications. DPX R9674 + Agral 90 could therefore be used safely on Duke, Sabina and Chapais varieties without fear that crop injury would be higher on one variety than the other. Yield data further supported this as there was no significant differences between treatments for any variety.

Weed control was excellent from both DPX R9674 + Agral 90 and MCPA. DPX R9674 was slightly more effective than MCPA but not significantly. Both provided significant weed control throughout the rating periods. By the last assessment date both treatments provided over 80% weed control.

DPX R9674+ Agral 90 could therefore be used effectively and safely on Duke, Sabina, and Chapais varieties with excellent weed control.

ACKNOWLEDGEMENTS: Special thanks is extended to Anthony Smith and the summer students under his direction. Their assistance from planting to harvest was invaluable and appreciated.

TABLE 1. Yields and Visual Ratings on Crop Injury and Weed Control in Barley

TREATMENT	Rate Kg(a.i.) /ha	VARIETY	CROP INJURY (0-100%)		% WEED CONTROL (0-100%)			YIELD kg/m^2 Aug. 8
			June 11	June 25	June 11	June 25	July23	
			days after appl. 14	28	Days after application 14	28	56	
Control	-	DUKE	0 N.S.	0 N.S.	0 b	0 b	0 b	462 n.s.
MCPA	0.75	DUKE	7.5	0	95 a	98 a	81 a	461
DPX R9674 + Agral 90	0.015 +0.2 % v/v	DUKE	7.5	0	95 a	99 a	97 a	454
Control	-	SABINA	0	0	0 b	0 b	0 b	477
MCPA	0.75	SABINA	0	0	95 a	70 a	95 a	461
DPX R9674 + Agral 90	0.015 + 0.2% v/v	SABINA	7.5	0	95 a	98 a	98 a	489
Control	-	CHAPAIS	0	0	0 b	0 b	0 b	468
MCPA	0.75	CHAPAIS	6.3	0	96 a	96 c	97 a	436
DPX R9674 + Agral 90	0.015 + 0.2% v/v	CHAPAIS	2.5	0	98 a	99 a	97 a	435

Means with the same letter are not significantly different at the 0.5 level of significance according to the Duncan's Multiple Range Test.

SMOOTH BEDSTRAW CONTROL IN NEW BRUNSWICK HAYFIELDS

K.V. McCully, M.A. Mann, and D.O. Hanscomb

ABSTRACT: Two trials to evaluate various herbicides applied either one day after, or 14 days after the last cut, were conducted to evaluate their effectiveness in controlling bedstraw within a hay crop. Results indicated that higher levels of bedstraw control could be expected by waiting and applying treatments when bedstraw regrowth levels reached approximately 11 cm (2 weeks after cutting) instead of applying treatments immediately after harvest. The best overall treatment in both trials was triclopyr. This treatment resulted in 92% bedstraw control when applied to regrowth. No significant crop injury was observed from any of the treatments throughout the assessment period.

SUPPRESSION DU GAILLET MOLLUGINE DANS LES PRÉS DE FAUCHE AU NOUVEAU-BRUNSWICK

K.V. McCully, M.A. Mann et D.O. Hanscomb

RÉSUMÉ : On a appliqué divers herbicides un jour après la dernière coupe et quatorze jours après la dernière coupe afin de déterminer leur taux de répression du gaillet mollugine dans les prés de fauche. Les essais nous ont permis de constater une plus grande efficacité du traitement lorsque la repousse atteint environ 11 cm (2 semaines après la coupe) que si l'on procède au traitement immédiatement après la coupe. Dans les deux essais, l'herbicide le plus efficace, le triclopyr, a entraîné un taux de répression de 92 % du gaillet mollugine lorsqu'il a été appliqué deux semaines après la coupe. On n'a constaté aucun effet néfaste des herbicides sur les cultures durant la période d'évaluation.

INTRODUCTION: Bedstraw (Galium mollugo) has been increasing and spreading throughout the province the past number of years. It is often first observed along roadsides and over time can spread by both seed and rhizome into agricultural fields. It appears to prefer older undisturbed land, such as hay fields, that are low in fertility. Bedstraw is undesireable because it makes harvesting difficult, has little nutritional value and can outcompete hay over time.

Bedstraw is not as serious in annually tilled fields as it is in fields planted to perennial crops. Presently there are no herbicides registered for bedstraw control in perennial crops such as hay. Previous research was conducted in the spring on early bedstraw growth (see McCully et.al, 1988,1990), but the threat of residues remaining on the hay was a concern. As a result two trials were established to evaluate various herbicides. In trial 1, treatments were apllied immediately after the last cut and in trial 2 selected treatments were applied to regrowth two weeks after the last cut. By waiting until late in the season to apply treatments, the treated crop would not be cut and fed until the following year, at which time residues would be of less concern.

MATERIALS AND METHODS: Two trials were established in Fredericton, York County, one immediately after cutting (Trial 1) and the other, two weeks after cutting (Trial

2). Both Experimental designs were randomized complete blocks with four replicates. Herbicides were applied using a CO_2 backpack sprayer at a pressure of 207 kPa and a water volume of 200 L/ha. Plot size was 2m x 6m for Trial 1 and 2 m x 3 m for Trial 2. Previous crops in both trials was hay.

Trial I was cut August 7/91 and herbicides (Table 1) applied August 8. Visual assessments on crop phytotoxicity and weed control were taken August 22, September 6, September 30 and November 26. Rainfall was 43.6 mm seven days before application and 62.4 mm, seven days after.

Trial 2 was cut August 15, 1991 and herbicides (Table 2) applied August 29. Visual assessments on crop phytotoxicity and weed control were taken September 6, September 30 and November 26. Rainfall was 58.6 mm seven days before application and 63.1 mm seven days after.

Arcsin transformations were performed on visual observations where necessary. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

Trial#1: Application of herbicides the day after mowing Results indicate that all treatments provided significant bedstraw control as compared to the untreated check plots throughout the assessment period. Control ranged from 42.5% to 80% control by the final Nov.26 assessment date (Table 1). The only treatments resulting in over 75% control at this time were triclopyr 1.25 kg(a.i.)/ha (78.5%) and triclopyr 1.75 kg(a.i.)/ha (80.0%). Dicamba+ mecoprop applied at the highest rate (1.1+1.1 kg(a.i.)/ha) resulted in high levels of initial control but recovered as the fall progressed. No significant crop injury was observed from any of the treatments throughout the assessment period.

Trial #2: Application of herbicides 2 weeks after mowing: Results from this trial indicate that higher levels of bedstraw control can be expected if treatments are delayed until bedstraw regrowth reaches approximately 11.0 cm in height (2 weeks after cutting) (Table 2). This trial contained the same treatments as in Trial #1 but only at the lowest rates. The only treatment providing unacceptable control throughout the rating period was mecoprop applied alone at 1.1 kg(a.i)/ha. The remaining treatments all provided over 80.0% control by the Nov.26 assessment date and were not significantly different from one another. The best overall treatment throughout the rating period was triclopyr, which by the final rating provided 92.0% bedstraw control. No significant crop injury was observed from any of the treatments throughout the assessment period.

CONCLUSIONS: Bedstraw control will be more effective if treatments are applied to bedstraw regrowth 14 days following cutting than if applied immediately following cutting. This could be expected as the herbicides evaluated are absorbed mostly through the foliage. Regrowth will also be actively growing resulting in a greater degree of translocation. The best overall treatment in both trials was triclopyr. The worst treatment was mecoprop applied alone. The remaining treatments control levels were very similar to each other. No crop injury was observed from any of the treatments.

REFERENCES: McCully,K.V., M.A. Mann and D.O. Hanscomb. 1990. Bedstraw control in a timothy/alfalfa mix. Adpt. Res. Rpt. 12,169-172.

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TABLE I. % Bedstraw Control Immediately after Cut

TREATMENT	RATE kg(a.i.) /ha	Aug. 22 %	Sept. 6 %	Sept. 30 %	Nov. 26 %
Control	-	0 c*	0 e	2.5 d	17.5 b
Mecoprop	1.1	56.25 b	32.75 d	35 c	57 ab
Triclopyr	1.25	82 a	87.5 a	67.25 ab	78.5 a
Triclopyr	1.75	83.75 a	94.0 a	74.75 a	80 a
Fluroxypyr	0.35	68.5 b	42.25 cd	34 c	57 ab
Fluroxypyr	0.45	69.5 b	57.75 bc	44.25 c	57.5 ab
Dicamba + Mecoprop	1.1 + 0.6	68 b	84.5 a	46.25 c	61.5 a
Dicamba + Mecoprop	1.1 + 1.1	87 a	72.25 ab	48.5 bc	42.5 ab

*Means with the same letter are not significantly different at the 0.5 level of significance according to the Duncan's Multiple Range Test. Visual Ratings are expressed as a percentage (0-100%)

TABLE II. % Bedstraw Control after 2 weeks of Regrowth

TREATMENT	RATE Kg(a.i.) /ha	Sept. 6 %	Sept. 30 %	Nov. 26 %
Control	-	0 c*	0 b	0 b
Mecoprop	1.1	67 b	71.75 a	63.75 a
Triclopyr	1.25	75 a	92 a	92 a
Fluroxypyr	0.35	62.5 b	92.5 a	82.75 a
Dicamba Mecoprop	1.1 + 0.6	63.75 b	90 a	90.75

Means with the same letter are not significantly different at the 0.5 level of significance according to the Duncan's Multiple Range Test. Visual Ratings are expressed as a percentage (0-100%)

EVALUATION OF REGISTERED HERBICIDES FOR FIELD CORN WEED CONTROL

K.V. McCully, R. Carmichael, M.A. Mann, and D.O. Hanscomb

ABSTRACT: A trial to evaluate various registered corn herbicides applied either preemergence, early post-emergence (2-3 leaf) or late post-emergence (4-5 leaf) was conducted to evaluate and demonstrate their efficacy on weed control and crop tolerance. Visual ratings on crop damage, broadleaf weed and grass control were collected, in addition to corn yields. Results indicated that initial crop injury was observed from a number of treatments, but they all recovered by August 15. Broadleaf weed pressure was light throughout the trial area, resulting in variable broadleaf weed control results. By August 15, broadleaf weed control ranged from 61.25 to 91.25% within the treated plots, but were not significantly different from one another. Grass control was unacceptable from all treatments, as quackgrass was the predominant grass species. Yield data indicated that although yields varied from 3.98 to 6.37 t/ha, differences were not significant. There was also no clear relationship between weed control and yields, or crop injury and yields. Treatments containing metolachlor (except when pre-mixed i.e. metolachlor/atrazine) or dicamba (except when pre-mixed in 2,4-D/mecoprop/dicamba) did appear to reduce yields however. The highest yielding treatments included, 2,4-D/mecoprop/dicamba (6.3 t/ha), atrazine pre (6.32 t/ha), metolachlor/atrazine pre (6.16 t/ha), cyanazine pre (6.15 t/ha) and bromoxynil (6.14 t/ha). These treatments should be further evaluated under heavier weed pressures.

ÉVALUATION D'HERBICIDES ENREGISTRÉS POUR LA SUPPRESSION DES MAUVAISES HERBES DANS LES CHAMPS DE MAÏS FOURRAGER

K.V. McCully, R. Carmichael, M.A. Mann et D.O. Hanscomb

RÉSUMÉ : On a effectué des essais afin d'évaluer l'efficacité et la tolérance par les cultures de divers herbicides enregistrés pour le maïs à vaporiser soit à la prélevée, peu de temps après la levée (2 à 3 feuilles) ou plus longtemps après la levée (4 à 5 feuilles). On a procédé à des évaluations visuelles de la suppression des cotylédones et graminées, des dommages causés aux cultures et du rendement des champs de maïs. On a constaté des dommages causés au maïs par un certains nombre de traitements, mais tous les champs s'étaient remis des traitements au 15 août. Une faible densité de cotylédones dans toute la surface d'essai a entraîné des résultats variables pour la suppression des cotylédones. Au 15 août, le taux de répression des cotylédones variait entre 61,25 et 91,25 % sur les parcelles traitées, mais il ne variait pas tellement d'une parcelle à l'autre. La suppression des graminées était inacceptable pour tous les traitements, car le chiendent était l'espèce prédominante. En ce qui concerne le rendement, on a enregistré des chiffres entre 3,98 et 6,37 t/ha et on n'a pas constaté d'écarts importants. En outre, aucun rapport précis n'a été remarqué entre la suppression des mauvaises herbes et le rendement ou entre les dommages aux cultures et les rendements. Les traitements qui contiennent du metolachlore (sauf dans un pré-mélange comme du metolachlore/atrazine) ou du dicamba (sauf dans un pré-mélange de 2,4-D/mécoprop/dicamba) ont toutefois semblé réduire le rendement. Les traitements ayant produit les rendements les plus élevés étaient les suivants : 2,4-D/mécoprop/dicamba (6,3 t/ha), atrazine à la prélevée (6,32 t/ha), methlachlore/atrazine à la prélevée (6,16 t/ha), cyanazine à la prélevée (6,15 t/ha) et bromoxynil (6,14 t/ha). Il importe d'évaluer ces traitements de façon plus approfondie en présence d'une plus forte densité de mauvaises herbes.

INTRODUCTION: Of all the crops grown in New Brunswick, field corn producers have the greatest selection of herbicides available. Herbicides can be applied preplant incorporated, preemergence, early post emergence (2-3 leaf) and late post emergence (> 4 leaf). In addition, many of the same herbicides can be applied at more than one application timing (i.e. ppi, pre or post). This often makes it difficult for growers to decide which herbicide and timing to choose for the best results. A trial was therefore conducted to evaluate and demonstrate the weed control and crop tolerance from a number of registered herbicides applied pre-emergence, early post-emergence (2-3 leaf) and/or late post-emergence (4-5 leaf).

MATERIALS AND METHODS: "Pioneer 3979" field corn was planted May 4, 1991 in a trial at Centreville, Carleton Co. The soil type was a silt loam with a pH of 5.1 . The organic matter content was 4.0% and the sand/silt/clay ratio was 34:46:21. Seeding rate was 64220 plants/ha with a 91 cm row spacing. 448 kg/ha of 21-00-22 and 224 kg/ha of 18-46-00 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 1m x 6 m. Previous crop was alfalfa. Preemergence (PRE) herbicides (Table 1) were applied May 15. Early post-emergence (EPOST) herbicides (Table 1) were applied June 3 at the 2-3 corn leaf stage. Post emergence (POST) herbicides (Table 1) were applied June 17 at the 4-5 corn leaf stage. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 250 L/ha at 207 kPa of pressure. Rainfall levels were 0 mm seven days before PRE application, and 90 mm fourteen days after. Rainfall levels seven days before EPOST applications were 8 mm, and 85 mm fourteen days after. Rainfall levels seven days before POST applications were 85 mm, and 3mm fourteen days after. Visual assessments on crop phytotoxicity, and weed control were taken on June 3, June 21, July 5, July 18 and August 15. Harvest was October 21. Logarithmic transformations were performed on yield data and arcsin transformations were performed on visual observations where necessary. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

Crop injury: On June 21 (37 days after the preemergence application, 18 days after the early post applications, 4 days after the late post applications) crop injury was assessed. Results indicated that all treatments displayed some injury symptoms, ranging from 2.5 to 23.8% (Table 1). Only two treatments, cyanazine W.G. + metolachlor applied early post (2-3 leaf) (23.8%) and bromoxynil (18.8%) resulted in crop injury levels significantly higher than the untreated control, however.

By July 18, 7 treatments had crop injury levels over 10% but were not significantly different from one another (Table 1). These included cyanazine W.G. + metolachlor (2-3 leaf) (23.8%), cyanazine W.G. (2-3 leaf) (18.8%), cyanazine + dicamba (pre) (16.3%), 2,4-D/Mecoprop/dicamba (4-5 leaf) (15.0%), metolachlor/atrazine (pre) (14.5%), metolachlor + dicamba (pre) (12.7%) and atrazine + C.O.C. (4-5 leaf) (11.5%). The only treatment significantly higher than the untreated control however, was cyanazine W.G. + metolachlor (2-3 leaf) (23.8%).

By August 15 all treatments recovered and were not significantly different from one another or the untreated control. Crop injury reported in the untreated control at this time was the result of weed competition.

Broadleaf weed control: Broadleaf weed pressure was light throughout the trial area, making weed control evaluations difficult. Broadleaf weeds present included mustards, alfalfa, lamb's quarters, chickweed, dandelion and wild buckwheat. June 21 ratings (37 days after pre; 18 days after epost (2-3 leaf); 4 days after late post (4-5 leaf)) indicated that only three treatments, metolachlor/atrazine (pre), atrazine (pre) and 2,4-D/mecoprop/dicamba resulted in control levels not significantly different from the untreated control plots (Table 1). Six treatments provided control levels over 80.0% and were not significantly different from each other. The three most effective treatments at this time were bromoxynil (91.25%), atrazine + dicamba (pre) (87.5%) and cyanazine (pre) (86.25%).

By August 15, it was difficult to distinguish weed control differences due to the light weed pressure. All treatments resulted in weed control significantly higher than the untreated control (61.25 to 91.25%), but were not significantly different from one another (Table 1). Only 5 treatments resulted in control levels less than 80.0% (Table 1). The most effective treatments were metolachlor + atrazine + linuron (pre) (91.25%), cyanazine + dicamba (pre) (91.25%), atrazine + dicamba (pre) (90.0%), bromoxynil (post) (90.0%) and cyanazine (pre) (89.5%).

Grass control: Grass pressure was very light and variable throughout the trial site making evaluations difficult. Grasses present at low densities included quackgrass and barnyard grass. By August 15 control levels varied from 0 to 55.3% for all treatments but differences were not significant. Grass control levels were therefore unacceptable from all treatments. This could be expected as quackgrass was the predominant grass weed at the trial site, and none of the treatments evaluated are known to be effective quackgrass control herbicides.

Yields: Although yields varied from 3.98 to 6.37 t/ha, differences were not significant. Variability in treatment yields across the replicates were responsible for the differences not being significant. Weed pressure was light throughout the trial area, making yield differences due to weed control only minor. Corn plant counts were also taken but were not significantly different from one another.

The highest yielding treatments were 2,4-D/mecoprop/dicamba (6.37 t/ha), atrazine (6.32 t/ha), metolachlor/atrazine (2-3 leaf) (6.16 t/ha), cyanazine (pre) (6.15 t/ha) and bromoxynil (6.14 t/ha).

Treatments containing metolachlor (except metolachlor/atrazine) or dicamba (except 2,4-D/mecoprop/dicamba) resulted in poor yields. Metolachlor + cyanazine when applied either pre or early post emergence, resulted in the two lowest yields.

CONCLUSIONS: Although initial crop injury was reported from a number of treatments, they all recovered to levels not significantly different from one another or the control by August 15. Broadleaf weed pressure was light throughout the trial area, making evaluations difficult. By August 15 control levels ranged from 61.25 to 91.25% and were not significantly different from one another. The only treatments providing less than 80.0% broadleaf weed control at this time were 2,4-D/mecoprop/dicamba (post) (75.0%), atrazine (pre) (72.0%); atrazine + C.O.C. (post) (68.75%), metolachlor/atrazine (pre) (65.0%)and cyanazine W.G. (Epost) (61.25%). The predominant grass species within the plots was quackgrass. None of the treatments provided acceptable grass control.

Although yields varied between treatments, differences were not significant from each other or the control. There did not appear to be any relationship between weed control and yields. This could be expected as weed pressure was light throughout the trial area and would not affect yields to any great degree. In addition, there did not appear to be any strong relationship between crop injury and yields. Treatments containing metolachlor (except metolachlor/atrazine) or dicamba (except 2,4-D/mecoprop/dicamba) generally resulted in the lowest yields, indicating that crop tolerance may have been responsible for some yield differences.

The highest yielding treatments were 2,4-D/mecoprop/dicamba (6.37 t/ha), atrazine pre (6.32 t/ha), metolachlor/atrazine (2-3 leaf) (6.16 t/ha), cyanazine (pre) (6.15 t/ha) and bromoxynil (6.14 t/ha). Corn was therefore very tolerant to these treatments and should be further evaluated under a heavier weed pressure.

Table 1. Yields Visual Ratings on Crop Injury and Weed Control in Corn

TREATMENT	RATE Kg (a.i.)/ha	TIMING	% CROP DAMAGE (0-100%)	% CROP DAMAGE (0-100%)	%CROP DAMAGE (0-100%)	% BROAD-LEAF WEED CONTROL (0-100%)	% BROAD-LEAF WEED CONTROL (0-100%)	% GRASS CONTROL (0-100%)	YIELDS T/ha15.5% moisture
			June 21	July 18	Aug. 15	June 21	Aug. 15	Aug. 15	Oct. 21
Control	-	-	6.3 cd *	5.0 bcde	12.5 ns	12.5 e	0 b	0 b	5.35 ns
Metolachlor + Dicamba	2.0 + 0.6	Pre	7.5 bcd	12.7 abcd	0	67.5 abcd	88.75 a	49.7 a	4.36
Metolachlor + Atrazine + Linuron D.F.	2.0 + 1.1 + 0.5	Pre	8.8 bcd	7.0 bcde	0	75.0 ab	91.25 a	53.0 a	5.46
Cyanazine	2.75	Pre	3.8 cd	5.0 bcde	2.5	86.25 ab	89.50 a	55.3 a	6.15
Metolachlor/atrazine	3.75	Pre	8.8 bcd	14.5 abcd	0	32.5 de	65.00 a	48.9 a	5.77
Metolachlor + Cyanazine	2.0 + 2.0	Pre	3.8 cd	0 e	0	80.0 ab	87.75 a	41.4 a	3.98
Atrazine	2.0	Pre	5.0 cd	6.3 cde	2.5	35.0 de	72.00 a	37.0 a	6.32
Cyanazine + Dicamba	2.75 + 0.6	Pre	12.5 abcd	16.3 ab	0	82.5 ab	91.25 a	52.1 a	5.64
Atrazine + Dicamba	2.0 + 0.6	Pre	2.5 d	0 e	2.5	87.5 ab	90.00 a	35.8 a	5.55
Atrazine + Corn Oil Concentrate	1.5 + 2.5L/ha	4-5 leaf	15.0 abc	11.5 abcd	2.5	82.5 ab	68.75 a	51.1 a	5.44
Bentazon/Atrazine + Assist	1.2 + 2L/ha	4-5 leaf	12.5 abcd	6.3 bcde	0	60.0 abcd	83.75 a	35.8 a	5.89
Bromoxynil	0.28	4-5 leaf	18.8 ab	2.5 de	2.5	91.25 a	90.00 a	0 b	6.14
Cyanazine W.G.	2.25	2-3 leaf	12.5 abcd	18.8 abc	0	52.50 bcd	61.25 a	34.6 a	5.79
2,4-D/Mecoprop/Dicamba	0.47	4-5 leaf	13.8 abcd	15.0 abcd	3.8	37.5 cde	75.00 a	38.2 a	6.37
Metolachlor/Atrazine	3.75	2-3 leaf	7.5 bcd	5.0 de	2.5	52.5 bcd	82.50 a	45.2 a	6.16
Cyanazine W.G. + Metolachlor	2.0. + 2.0	2-3 leaf	23.8 a	23.8 a	0	72.5 abc	83.75 a	53.4 a	4.29
Dicamba / Atrazine	1.6	4-5 leaf	6.3 cd	5.0 bcde	2.5	50.0 bcd	86.25 a	42.4 abc	4.64

*Means followed by the same letter are not significantly different at the 0.05 level of significance according to the Duncan's Multiple Range Test. Visual Ratings are expressed as a percentage (0-100%)

WEED CONTROL IN SWEET CORN GROWN UNDER PLASTIC

K.V. McCully, M.A.Mann, and D.O. Hanscomb

ABSTRACT: A trial to evaluate 3 different pre-emergence herbicides, applied either alone or in various combinations was conducted in sweet corn grown under clear plastic. Visual ratings on weed control and crop injury were collected, in addition to yields, number of cobs per treatment and average cob length. Results indicated that no visual crop injury was observed from any treatment throughout the assessment period. The worst weeds present were the annual grasses, smooth crabgrass and witchgrass (Panicum sp.). The two treatments containing metolachlor: metolachlor + cyanazine (86.3%) and metolachlor/atrazine (79.0%) provided the highest levels of grass control by the July 29 assessment date. Metolachlor was necessary for high levels of annual grass control. Although yields, cob numbers and cob length varied between treatments, none of the treatments were significantly different from one another or the untreated control. The two highest yielding treatments were cyanazine, and metolachlor+cyanazine.

SUPPRESSION DES MAUVAISES HERBES DANS LE MAIS SUCRÉ CULTIVÉ SOUS UNE PELLICULE DE PLASTIQUE

K.V. McCully, M.A. Mann, D.O. Hanscomb

RÉSUMÉ : On a procédé à des essais afin d'évaluer l'efficacité de trois différents herbicides de prélevée appliqués seuls ou dans divers mélanges sur du maïs sucré cultivé sous une pellicule de plastique. On a effectué des évaluations visuelles de la suppression des mauvaises herbes, des dommages causés au maïs, du rendement, du nombre d'épis pour chaque traitement et de la longueur moyenne des épis. On n'a constaté aucun dommage causé par l'un des traitements durant toute la période d'évaluation. Les mauvaises herbes prédominantes étaient les graminées, la digitaire astringente et le panic capillaire (Panicum). Les deux composés qui contenaient du metolachlore, metolachlore + cyanazine (86,3 %) et metolachlore/atrazine (79,0 %), présentaient les meilleurs taux de répression de mauvaises herbes à la date de l'évaluation, le 29 juillet. Le metolachlore était requis pour une forte suppression des graminées. Bien que le rendement, le nombre d'épis et la longueur des épis variaient d'un traitement à l'autre, on n'a pas constaté d'importants écarts entre les divers traitements et par rapport au maïs témoin n'ayant subi aucun traitement. Les traitements qui ont entraîné les deux meilleurs rendements étaient ceux à la cyanazine et au metolachlore additionné de cyanazine.

INTRODUCTION: In New Brunswick approximately 600 acres of sweet corn are grown. Of this, approximately 150 acres are grown under plastic. By following this production practice corn maturity can be significantly advanced. As a result corn can be available for the early market where higher prices can be demanded.

Herbicides registered for use on sweet corn grown under plastic have not been tested extensively. It is not well known how tolerant corn is or how weed control may be affected. A trial was therefore established to evaluate the efficacy of various herbicides on weed control and crop tolerance when applied to corn grown under plastic.

MATERIAL AND METHODS: "Spartan" Sweet Corn was planted in Fredericton May 9, 1991 in a sandy loam soil. Seeding rate was 22 seeds/m^2 and the row spacing 56 cm. 222 kg/ha of 15-15-15 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 6 m. Previous crop was sweet corn. Preemergence herbicides (Table 1) were applied May 9 using a CO_2 backpack sprayer. Treatments were applied in a water volume of 250 L/ha at a pressure of 207 kPa. Clear plastic was applied over a 10 cm deep trench on May 16 and removed on May 31. Rainfall levels were 23 mm, seven days prior to application and 1 mm and 35 mm seven and fourteen days after.

Visual assessments on crop phytotoxicity and individual weed species control were taken on May 30, June 18, June 28 and July 29. On August 8, yields, the average length of 10 cobs, and average number of cobs per treatment were taken. Analysis of variance was performed on data and arcsin transformations performed on the visual ratings where necessary. Yields and cob measurements were transformed using logs. Means were separated by Duncan's multiple range test.

RESULTS AND DISCUSSION:

Crop injury: No herbicide injury was observed from any treatment throughout the assessment period. Some crop stunting was observed later in the season, but this was the result of extensive weed pressure from the annual grasses and not from the herbicides. Any of the herbicides tested could therefore be used safely on Spartan Sweet Corn.

Broadleaf weed control: Broadleaf weeds were observed after the plastic was removed, but as the season progressed were mostly smothered out by the annual grasses. Broadleaf weeds observed in plots included red root pigweed, lamb's quarters and wild buckwheat.

At the May 30 and July 29 assessment dates, red root pigweed control was 100% for all treatments (Table 1). Lamb's quarters was controlled over 91% by all except the metolachlor+cyanazine treatment (80.7%) at the July 29th assessment date. At the May 30 assessment date only two treatments, atrazine (50.0%), and cyanazine + atrazine (61.3%), provided wild buckwheat control levels less than 95%. By July 29, however all treatments except metolachlor/atrazine (65.0%) provided 100% wild buckwheat control.

Grass control: The two predominant grass weed species in the plots were witchgrass (Panicum spp.) and smooth crabgrass. Grass densities were very high within the plots and as a result smothered out most of the broadleaf weeds. In addition corn in the control plots was outcompeted and not very productive.

On the day the plastic was removed (May 30) it was evident that two treatments were not controlling grasses as well as the other treatments. Atrazine provided 33.8% and cyanazine + atrazine provided 53.8% grass control. The remaining treatments all provided over 92% grass control (Table 1).

By the final July 29 assessment date, these same two treatments still provided poor weed control. Atrazine provided 12% while cyanazine + atrazine provided 28.8% grass control. Cyanazine applied alone also resulted in substandard levels of grass control (42.5%) which would explain why the tank mix of atrazine and cyanazine performed poorly. The tank mix of metolachlor + cyanazine (86.3%) and the premix of metolachlor/atrazine (79.0%) provided the highest levels of grass control and were not significantly different from one another. The metolachlor component of these treatments, was therefore, responsible for the high levels of grass control, as cyanazine and atrazine applied alone resulted in low levels of control.

As the season progressed it was also evident that the area where the soil was disturbed from the removal of the plastic, caused increased weed seed germination.

Yields, cob number, and length of cobs: Although yields, number of cobs, and the average length of cobs varied from treatment to treatment, none were significantly different from one another. Reasons for this was the treatments variability over the four replicates. Yields and the number of cobs per treatment were collected over the entire plot area. Unfortunately, corn plant counts were not collected so it could not be determined if the yields and cob number differences were due to differences in the number of corn plants per treatment or to actual increased yields per plant.

The highest yielding treatment was cyanazine applied alone (8.3 kg) (Table 1). The high yields from this treatment was the result of a high cob number (63), but it is not known if it was the result of more cobs per plant or more corn plants per treatment. Visual percentage germination and average cob length figures indicate that the high yields were probably the result of more plants per treatment and also a high cob length. Grass control with cyanazine was initially high but decreased by harvest. This would indicate that weed competition was held back enough at the early critical times to not affect final yields.

The second highest yielding treatment was metolachlor + cyanazine (7.0 kg). By looking at the % germination and average length of 10 cobs data, it can be seen that this treatment had the lowest percent germination of all treatments, but the highest average cob length. The increased cob length size was therefore responsible for the high yields. This could be expected as this treatment had the highest levels of grass control by the last assessment date. This provided less competition to the corn plant, and allowed the cob to increase in size. Metolachlor/atrazine and cyanazine + atrazine were the next highest yielding treatments (6.6 kg) followed lastly by atrazine (5.1 kg). As previously mentioned however, yields were not significantly different from each other or the control.

CONCLUSIONS: No crop injury was observed from any treatment at any assessment date. Some crop shortening was observed in untreated control plots, but could be attributed to high levels of weed competition.

Smooth crabgrass and witchgrass (Panicum sp.) were the most prevalent weeds found at the trial site and had densities high enough to smother out most all broadleaf weeds. The two treatments containing metolachlor: metolachlor + cyanazine (86.3%) and metolachlor/atrazine (79.0%) resulted in the highest levels of annual grass control by the final July 29th assessment date. Metolachlor was therefore necessary for high levels of annual grass control. Grass control was poorest where the soil had been disturbed upon removal of the plastic.

Although yields, cob numbers and cob lengths varied from treatment to treatment none of the differences were significant from each other or the untreated control. Cyanazine applied alone was the highest yielding treatment. Although cyanazine + metolachlor was the second highest yielding treatment, it is likely that it would have outyielded cyanazine if they both had the same number of corn plants per plot. Based upon visual percent germination, cyanazine + metolachlor had the lowest germination level, but had the highest grass control rating and the longest average cob length.

Overall, any of the treatments could be applied safely on Spartan sweet corn grown under plastic. The herbicide chosen should depend upon the history of the weed problem at the planting site.

ACKNOWLEDGEMENTS: Appreciation is extended to Alan Macdougall for providing the trial site and for his assistance during trial.

TABLE 1. Visual % Weed Control Ratings and Corn Yield Data

TREATMENT	RATE kg(a.i.) /ha	TIMING	VISUAL % GERMINATION	% GRASS CONTROL (0-100%)			% RED ROOT PIGWEED CONTROL (0-100%)		% LAMBSQUARTERS CONTROL (0-100%)		% WILD BUCKWHEAT CONTROL (0-100%)		YIELD kg/Plot	#COBS /TRMT	AVERAGE LENGTH OF 10 COBS (cm)
				May 30	June 28	July 29	May 30	June 29	May 30	July 29	May 30	July 29	Aug. 8	Aug. 8	Aug. 8
Control	-	-	60.00 ab *	0 d	0 c	0 d	0 b	0 b	0 b	0 b	0 c	0 c	4.1 ns	39 ns	13.88 ns
Cyanazine	2.25	pre	73.75 a	92.3 a	73.8 ab	42.5 b	100 a	100 a	96 a	91.3 a	94.8 a	100 a	8.3	63	17.67
Metolachlor/ Atrazine	3.75	pre	61.25 ab	97.5 a	87.5 a	79.0 a	100 a	100 a	100 a	95.7 a	98.8 a	65 b	6.6	45	14.75
Metolachlor + Cyanazine	2.0 + 2.0	pre	52.50 b	97.5 a	70.0 ab	86.3 a	100 a	100 a	97.5 a	80.7 a	97.5 a	100 a	7.0	42	18.73
Atrazine	1.75	pre	75.00 a	33.8 c	40.0 b	12.0 cd	100 a	100 a	100 a	100 a	50.0 b	100 a	5.1	45	13.63
Cyanazine + Atrazine	2.25 + 1.1	pre	62.50 ab	53.8 b	57.5 ab	28.8 bc	100 a	100 a	100 a	92.5 a	61.3 b	100 a	6.7	43	14.23

* Means followed by the same letter are not significantly different at the 0.05 level of significance according to the Duncan's Multiple Range Test.

WEED CONTROL IN NO TILL CORN

K.V. McCully, R. Carmichael, M.A. Mann, and D.O. Hanscomb

ABSTRACT: A trial to evaluate preplant applications of glyphosate mixed with 2,4-D, dicamba or surfactants was conducted to determine which treatment would result in the highest levels of vegetation burndown for no till corn to be planted. Preplant treatments were followed with various postemergent herbicides to evaluate the different combinations in terms of season long weed control. Crop injury, alfalfa, grass, dandelion and overall weed control ratings were collected, in addition to corn yields. Results indicated that initial corn injury was observed, but by August 15 all treatments recovered. Results also indicated that a post emergent herbicide was necessary for season long weed control. Glyphosate + 2,4-D was as effective as glyphosate + dicamba for alfalfa and vegetation burndown. The most effective and consistent post emergent herbicide was atrazine/dicamba (Marksman ^{tm}) applied over glyphosate + dicamba or glyphosate + 2,4-D treated plots. As expected, the treatments with high weed control levels also had high yields. The highest yielding treatment was glyphosate + dicamba (preplant) followed by bentazon/atrazine (Laddock ^{tm}) + assist (Post). Weed control was not as consistent as that obtained from atrazine/dicamba however. Glyphosate + 2,4-D(preplant) followed by atrazine/dicamba POST should be further evaluated as potential candidates for use in a herbicide program for corn grown under a no till management system.

SUPPRESSION DES MAUVAISES HERBES DANS LES CULTURES DU MAIS SANS TRAVAIL DU SOL

K.V. McCully, R. Carmichael, M.A. Mann et D.O. Hanscomb

RÉSUMÉ : On a effectué des essais afin d'évaluer des traitements de préplantation au moyen d'un composé de glyphosate mélangé avec du 2,4-D, du dicamba ou des tensio-actifs et de déterminer quel traitement entraînerait la plus forte suppression de mauvaises herbes aux fins de plantation du maïs sans travail du sol. Après les traitements de préplantation, on a essayé divers herbicides de postlevée afin d'évaluer la suppression des mauvaises herbes par les différents composés durant toute la saison. On a mesuré le rendement des champs de maïs, les dommages causés au maïs et la suppression de la luzerne, des graminées, des pissenlits et des mauvaises herbes en général. On a observé des dommages initiaux causés au maïs; cependant, le 15 août les champs s'étaient remis de tous les traitements. On a également constaté la nécessité d'utiliser un herbicide de postlevée aux fins de suppression des mauvaises herbes durant toute la saison. On a trouvé le glyphosate additionné de 2,4-D tout aussi efficace que le glyphosate additionné de dicamba pour la suppression de la luzerne et de la végétation. L'herbicide postlevée le plus efficace et le plus constant était de l'atrazine/dicamba (Marksman ^{MC}) appliqué aux parcelles traitées au glyphosate + dicamba ou au glyphosate + 2,4-D. Comme on l'avait prévu, les traitements ayant entraîné la plus forte suppression de mauvaises herbes ont aussi permis d'obtenir les meilleurs rendements. Le traitement ayant produit le plus haut rendement était un composé de glyphosate + dicamba (préplantation) suivi de l'application de bentazon/atrazine (Laddock ^{MC}) + Assist (postlevée). Toutefois, la suppression des mauvaises herbes n'était pas aussi efficace que celle obtenue au moyen de l'atrazine/dicamba. Il y a lieu d'évaluer de façon plus approfondie la possibilité d'utiliser comme herbicide un traitement au glyphosate + 2, 4-D (préplantation) suivi d'atrazine/dicamba (postlevée) pour la culture du maïs sans travail du sol.

INTRODUCTION: In any tillage system, weed control must be adequate or yields will suffer. As tillage is reduced, reliance on herbicide increases and with no tillage complete reliance for weed control is placed on herbicides. Currently within New Brunswick, corn production in a no till system is being evaluated. In order to evaluate this system fairly a weed control program must be devised so other benefits can be more fully realized.

In a no till production system, vegetation must be killed at planting time. Alfalfa, followed by corn is a common rotation, but alfalfa is often difficult to kill. Glyphosate (Round-up) before planting, often provides variable alfalfa control, but there are reports that the addition of 2,4-D or dicamba may provide more consistent control. In addition, long term weed control is required so a follow up application of post emergent herbicides are required. A trial to evaluate glyphosate applied alone or with 2,4-D or dicamba was therefore conducted to determine which treatment could provide the best vegetation burndown at planting time. Various post emergent treatments were then applied over these plots to determine which combination could provide the most effective long term weed control and highest yields.

MATERIALS AND METHODS: "Pioneer 3979" field corn was planted May 15, 1991 in a trial at Centreville, Carleton Co. The soil was a silt loam with a pH of 5.7, an organic matter content of 5.0 % and a sand/silt/clay ratio of 34:46:20. Seeding rate was 64220 plants/ha with a 91 cm row spacing. 448 kg/ha of 21-00-22 and 224 kg/ha 18-46-00 fertilizers were applied. Experimental design was a randomized complete block with four replicates. Plot size was 1 m X 6 m. Previous crop was alfalfa. Preplant (PP) herbicides (Table 1) were applied May 15 when the alfalfa was 10 cm high and the timothy was at the 4-5 leaf stage. Early post emergence (E Post) herbicides (Table 1) were applied June 3 when the corn was at the 2-3 leaf stage. Post emergence (POST) herbicides (Table 1) were applied June 14 when the corn was at the 4-5 leaf stage. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 200 L/Ha for PP herbicides and 250 L/ha for EPOST and POST applications. Sprayer pressure was 207 kPa.

Rainfall levels were 93 mm, seven days before PP application and 26.7 mm, fourteen days after. Rainfall levels seven days before EPOST applications were 3.5 mm and 77.6 mm, fourteen days after. Rainfall levels seven days before POST applications were 73.0 mm and 17.6 mm fourteen days after. Visual assessments on crop phytotoxicity and individual weed control were taken June 3, June 21, July 5, July 18 and August 15, 1991. Harvest was October 21. Logarithmic transformations were performed on yield data and arcsin transformations were performed on visual observations where necessary. Mean's were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

Crop injury: There was no corn injury following the preplant applications of glyphosate + dicamba or glyphosate + 2,4-D. Injury was not visible until post emergent treatments were applied at the 2-3 leaf stage (early post), or 4-5 leaf stage (late post). By July 5th (32 days after epost, 21 days after late post), the only treatments resulting in over 10.0% injury were, glyphosate + dicamba; metolachlor + cyanazine (21.25%), glyphosate + 2,4-D; 2,4-D/mecoprop/dicamba (15.0%), and glyphosate + 2,4-D; bentazon/atrazine + assist (12.5%) (see Table 1). All treatments providing less than 15.0% corn injury were not significantly different from one another. Injury from the untreated control (69.0%) was from weed competition, as the heavy weed pressure severely limited corn growth.

By August 15 (73 days after epost, 62 days after late post), only 5 treatments displayed any corn injury symptoms (Table 1). Injury however was felt to be the result of heavy weed competition, and not herbicide injury, as all treated plots resulted in significantly less crop stunting than the untreated control. The corn was therefore very tolerant to herbicides tested and weed pressure was more of a factor in determining corn vigour than herbicide damage.

Alfalfa control: Alfalfa control was evaluated June 3, 19 days after the preplant applications of glyphosate + Enhance, glyphosate + Agral 90, glyphosate + dicamba and glyphosate + 2,4-D were applied (post treatments were not applied yet). Overall results indicated that glyphosate + dicamba was slightly more effective than glyphosate + 2,4-D treated plots, which was slightly better than glyphosate + Agral 90 and glyphosate + Enhance. Differences between these treatments were not significant, however (Table 1).

Post emergent treatments were applied June 3 (epost) and June 14 (late post) over the previously treated pre plant plots. The July 5th and later ratings therefore evaluated these treatment combinations.

The July 5 assessment date, indicated that all plots treated with a post emergent treatment resulted in alfalfa control over 87.0% and were not significantly different from one another (Table 1). Glyphosate + Enhance was the only treatment not significantly different from the untreated control. Glyphosate + dicamba applied alone (62.25%) was still more effective than glyphosate + 2,4-D (53.75%) and glyphosate + Agral 90 (46.25%), but differences were not significant.

By August 15th the best treatments for alfalfa control were glyphosate + dicamba applied preplant followed by atrazine/dicamba post (96.25%) and glyphosate + 2,4-D preplant + atrazine/dicamba post (91.25%). Treatments providing over 63.75% alfalfa control were not significantly different from one another, indicating that treatment results were variable between replicates. The only treatment not significantly different from the control was glyphosate + Enhance. Glyphosate + 2,4-D (51.25%) applied alone was now better than glyphosate + dicamba (45.0%) but not significantly. The worst preplant/post treatment combination was glyphosate + 2,4-D preplant; bentazon/atrazine + assist post (50.0%)

Grass control: Grass control was excellent from most treatments throughout the assessment period (Table 1). The best treatments all contained atrazine or metolachlor, both of which have known activity on grasses. By August 15, thirteen treatments provided control levels from 75 to 92.5%, and were not significantly different from one another. Most all treatments were therefore effective in controlling grass.

The most effective grass control treatment was glyphosate + 2,4-D (preplant) + dicamba/atrazine (post) (92.5%). Treatments providing low levels of grass control included, glyphosate + dicamba preplant + 2,4-D/mecoprop/dicamba post (66.25%), glyphosate + 2,4-D preplant + 2,4-D/mecoprop/dicamba post (62.5%) and glyphosate + dicamba preplant + 2,4-D post (52.5%). These treatments all provided less than 67% grass control and were not significantly different from one another.

Dandelion control: Dandelions were found within each plot, but densities were generally light and variable making ratings difficult. On July 5 all treatments provided excellent dandelion control ranging from 82.5 to 100.0% (Table 1). Treatments resulting in control levels over 87.0% were not significantly different from one another.

By August 15 some dandelions started to recover in the treated plots. Control levels now ranged from 58.75% to 100.0% (Table 1). Only two treatments, glyphosate + dicamba (preplant) + atrazine/dicamba (post) (100%) and glyphosate + 2,4-D (preplant) + atrazine/dicamba (post) (97%) had control levels over 90.0%. Treatments resulting in over 75.0% control were not significantly different from one another however. The poorest post emergent treatments were those containing 2,4-D or 2,4-D/mecoprop/dicamba. Glyphosate + Agral 90 (80.75%) and glyphosate + enhance (85.0%) applied alone also provided high levels of dandelion control. This indicates that glyphosate and a surfactant may result in acceptable dandelion control levels.

Overall weed control: Overall weed control was evaluated on July 3 before any post treatments were applied.

Ratings collected at this time therefore evaluated the preplant applications of glyphosate + 2,4-D, glyphosate + dicamba and glyphosate plus a surfactant (Agral 90 or Enhance) with one another. Results indicated that all treatments provided excellent burndown, with control levels ranging from 79.75% to 95.0% (Table 1). There did not appear to be any significant advantage in adding 2,4-D or dicamba over a surfactant this time.

On July 5, overall weed control ratings now included results from the post emergent treatments applied after the preplant glyphosate applications. Results indicated that only one treatment, glyphosate + dicamba (57.5%) provided control levels under 80.0% (Table 1). Twelve treatments provided over 87.0% weed control and were not significantly different from one another. Overall weed control could therefore be considered excellent by most all treatments at this time.

By August 15, recovery and regrowth started to appear in plots. Eight treatments resulted in control levels over 85% and were not significantly different from one another (see Table 1). The two most effective treatments were glyphosate + dicamba (preplant) + atrazine/dicamba (post) (98.75%) and glyphosate + 2,4-D (preplant) + atrazine/dicamba (post) (96.25%). Treatments containing glyphosate + Enhance (77.5%) and glyphosate + Agral 90 (71.25%) provided higher levels of control than some of the post treatments. In general, post emergent treatments that were not residual (2,4-D, 2,4-D/mecoprop/dicamba) resulted in less control than the residual treatments (atrazine, cyanazine), although not always significantly less.

Yields: Corn was harvested October 21 and fresh weights were recorded. Yields were later converted to a 15.5% moisture equivalent for treatment comparison. Yield data indicated that all treated plots resulted in significant yield increases over the untreated control. Yields from treated plots ranged from 3.6 to 6.71 T/ha, with yields over 5.32 not being significantly different from one another (see table 1). The highest yielding treatments resulted from those which provided the highest levels of weed control throughout the assessment period. The top yielding treatments were glyphosate + dicamba (preplant) + bentazon\atrazine + assist (post) (6.71 T/ha); glyphosate + 2,4-D (preplant) + metolachlor + cyanazine (e post) (6.63 T/ha); glyphosate + dicamba (preplant) + atrazine/dicamba (post) (6.55 T/ha); glyphosate + 2,4-D (preplant) + atrazine/dicamba (post) (6.42 T/ha); and glyphosate + dicamba (preplant) + atrazine + C.O C. (post) (6.14 T/ha).

CONCLUSIONS: Some initial crop injury was observed early in the season particularly from glyphosate and dicamba (preplant) + metolachlor + cyanazine (e post) (21.25%) and glyphosate + 2,4-D (pre-plant) + 2,4-D/mecoprop/dicamba (post) (15.0%). All treatments recovered by August 15 however, at which time weed pressure was more of a factor in determining corn vigour than herbicide damage.

Glyphosate + dicamba resulted in a faster alfalfa burndown than glyphosate + 2,4-D, but over time glyphosate + 2,4-D was just as effective. An additional post emergent treatment is required following glyphosate applied alone, or when mixed with 2,4-D or dicamba, if season long control is desired. The most effective treatment in terms of crop injury, alfalfa control, grass control and overall weed control was glyphosate + dicamba (preplant) followed by atrazine/dicamba (Marksman™) (post 4-5 leaf). Atrazine/dicamba was also the second best treatment when applied following the preplant application of glyphosate+2,4-D. In terms of corn yields, the treatments with high levels of weed control also had high yields. The two post atrazine/dicamba treatments had the third and fourth highest yields but were not significantly lower than the highest yielding treatments. The two treatments providing the highest yields were glyphosate + dicamba (preplant) + bentazon/atrazine + assist (post), and glyphosate + 2,4-D (preplant) + metolachlor + cyanazine (e post). These two treatments also provided high levels of weed control.

Based on the results obtained in the trial, glyphosate + 2,4-D can be considered as effective as glyphosate + dicamba for alfalfa control and is a cheaper mix. Atrazine/dicamba provided the most consistent vegetation control of the post emergent products evaluated. Two other products resulted in slightly higher yields but weed control was less and results not as consistent. Glyphosate + 2,4-D preplant followed by atrazine/dicamba should be further evaluated for inclusion in a no till weed control program for corn.

Table 1. Yields and Visual Ratings on Crop Damage and Weed Control in No Till Corn

TREATMENT	RATE Kg(a.i.)/ha	TIMING	% CROP DAMAGE (0-100%)			% ALFALFA DAMAGE (0-100%)			% GRASS CONTROL (0-100%		% DANDELION CONTROL (0-100%)		% OVERALL GENERAL WEED CONTROL (0-100%)			YIELDS T/ha 15.5% moisture
			June 3	July 5	August 15	June 3	July 5	Aug.15	June 21	Aug.15	July 5	Aug.15	June 3	July 5	Aug.15	Oct.21
Control	-		0 ns	67.5 a	69.00 a *	0 c	0 c	0 f	0 b	0 c	0 c	0 f	0 c	0 f	0f	0.38 f
glyphosate + Dicamba	1.1 + 0.6	Preplant	0	2.50 c	6.25 b	90.0 a	61.25 b	45.00 cd	83.75 a	81.25 abc	82.50 b	761.25 bcde	95.00 a	57.50 e	67.50 cde	5.99 abc
glyphosate + Dicamba; Atrazine + C.O.C.	1.1 + 0.6; 1.5 +2.5L/ha	Preplant; 4-5 leaf	0	3.75 c	8.75 b	85.00 ab	93.25 a	86.25 ab	93.75 a	85.00 abc	94.00 ab	85.00 abcde	87.50 ab	97.50 abc	88.75 abcd	6.14 abc
glyphosate + Dicamba; metolachlor + Cyanazine	1.1 + 0.6; 1.9 + 2.0	Preplant; 2-3 leaf	0	21.25 b	0.00 b	90.00 a	87.00 a	63.75 abcd	73.75 a	87.50 abc	95.25 ab	75.00 abcde	87.50 ab	100.00 a	90.75 abcd	5.73 abc
glyphosate + Dicamba; 2,4-D/Mecoprop/Dicamba	1.1+0.6; 0.47	Preplant; 4-5 leaf	0	7.50 bc	0 b	82.50 ab	92.50 a	72.50 abc	87.25 a	66.25 bcd	96.50 a	72.00 bcde	88.75 ab	99.50 ab	80.00 bcde	5.32 abcd
glyphosate + Dicamba; Atrazine/Dicamba	1.1 + 0.6; 1.4	Preplant; 4-5 leaf	0	0 c	0 b	64.00 b	100.00 a	96.25 a	96.25 a	89.50 ab	98.75 a	100.00 a	82.50 b	100.00 a	98.75 a	6.55 ab
glyphosate + Dicamba; 2,4-D	1.1+0.6; 0.5	Preplant; 4-5 leaf	0	2.50 c	5.00 b	90.00 a	95.50 a	82.50 abc	80.00 a	52.50 d	97.00 a	59.50 de	91.25 ab	95.75 abc	63.75 de	5.14 bcd
glyphosate + Dicamba; Bentazon/Atrazine + Assist	1.1+0.6; 1.4+2L/ha	Preplant; 4-5 leaf	0	1.25 c	0 b	83.75 ab	87.50 a	77.50 abc	93.75 a	87.50 abc	86.25 ab	85.00 abcde	80.00 b	91.00 abcd	90.00 abcd	6.71 a
glyphosate + 2,4-D	1.1+1.0	Preplant	0	2.50 c	0 b	80.00 ab	53.75 b	51.25 bcd	78.75 a	75.00 abcd	87.00 ab	58.75 e	79.75 b	83.75 bcd	60.00 e	5.75 abc
Glyphosate+2,4-D; Atrazine +C.O.C.	1.1+1.0; 1.5+2.5L/ha	Preplant; 4-5 leaf	0	5.00 c	0 b	90.00 a	97.75 a	78.75 abc	98.75 a	88.25 ab	93.50 ab	85.75 abcd	87.50 ab	100.00 a	90.00 abc	5.55 abc
glyphosate +2,4-D; Metolachlor +Cyanazine	1.1+1.0; 1.9+2.0	Preplant; 2-3 leaf	0	0 c	0 b	83.75 ab	91.50 a	73.75 abc	77.50 a	85.00 abc	98.25 a	89.50 abc	85.00 ab	99.50 ab	90.00 abc	6.63 a
Glyphosate+ 2,4-D; 2,4-D/Mecoprop/Dicamba	1.1+1.0; 0.47	Preplant; 4-5 leaf	0	15.00 bc	0 b	81.25 ab	89.50 a	71.25 abc	85.00 a	62.50 cd	98.75 a	65.00 cde	90.00 ab	97.50 abc	68.75 cde	4.97 cd
glyphosate + 2,4-D; Atrazine/Dicamba	1.1+1.0; 1.4	Preplant; 4-5 leaf	0	2.50 c	0 b	86.25 a	95.75 a	91.25 a	93.75 a	92.50 a	97.50 a	97.00 ab	87.50 ab	99.50 ab	96.25 ab	6.42 abc
glyphosate + 2,4-D; 2,4-D	1.1+1.0; 0.5	Preplant; 4-5 leaf	0	6.25 bc	0 b	87.50 a	91.50 a	88.75 abc	96.[illegible] a	88.75 abc	97.00 a	70.00 cde	85.00 ab	87.50 abcd	66.25 de	5.6 abcde
glyphosate + 2,4-D; Bentazon/Atrazine + Assist	1.1+1.0; 1.4+2L /ha	Preplant; 4-5 leaf	0	12.50 bc	0 b	82.50 ab	90.00 a	50.00 bcd	91.25 a	90.00 ab	100.00 a	83.25 abcde	90.00 ab	99.50 ab	86.25 abcd	5.77 abc
glyphosate + Agral 90	1.1 + 0.2% v/v	Preplant	0	8.7 bc	21.25 b	82.50 ab	46.25 b	33.75 de	75.00 a	83.75 abc	93.25 ab	80.75 abcde	85.00 ab	83.25 c	0.9+ 0.5% v/v	4.07 de
glyphosate + Enhance	0.9+0.5% v/v	Preplant	0	5.00 c	16.25 b	78.25 ab	11.25 c	6.25 ef	87.50 a	83.75 abc	88.75	85.00 abcde	87.50 ab	80.25 d	77.50 bcde	3.6 e

* Means with the same letter are not significantly different at the 0.5 level of significance according to the Duncan' Multiple Range Test.

GRASS CONTROL IN FIELD CORN

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ABSTRACT: A trial to evaluate experimental and registered herbicides for grass control in field corn was conducted. Visual ratings on crop injury, broadleaf weed, quackgrass and annual grass control were collected, in addition to corn yields. By July 5, the most phytotoxic treatments were, DPX 79406 + bromoxynil + Agral 90 at both 0.01875 and 0.025 kg/ha+ 0.28 kg/ha+0.2% v/v rates. Treatments recovered as the season progressed however. Annual grasses (barnyard grass, foxtail) were the predominant weed species at the trial site and outcompeted most broadleaf weeds and quackgrass. The best overall treatments in terms of weed control and crop yields were DPX 79406 + bromoxynil + Agral 90 (0.1875+0.28 kg/ha +0.2%v/v), atrazine + C.O.C. and DPX E9636 + dicamba + Agral 90 treatments. Hoe 100063 + bromoxynil + Genapol provided very poor results since it did not control later germinating annual grasses. There did not appear to be any significant differences between glyphosate (Monsanto) and glyphosate (ICI Chipman).

SUPPRESSION DES MAUVAISES HERBES DANS LES CHAMPS DE MAIS FOURRAGER

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RÉSUMÉ : Les essais visaient à évaluer l'efficacité d'herbicides enregistrés ou au stade expérimental pour la suppression des mauvaises herbes dans les champs de mais. On a effectué des évaluations visuelles du rendement des champs de mais, des dommages causés au mais et de la suppression des dicotylédones, du chiendent et des graminées annuelles. Au 5 juillet, les composés les plus phytotoxiques étaient les suivants : DPX + bromoxynil + Agral 90 les deux à 0,01875 et 0,025 kg/ha + 0,28 kg/ha + 0,2 % à des taux v/v. Toutefois, les cultures s'étaient remises des traitements au fur et à mesure que la saison avançait. Les graminées annuelles (pied-de-coq et vulpin) étaient les mauvaises herbes prédominantes dans les champs d'essai et dépassaient en nombre la plupart des espèces de dicotylédones et de chiendent. Dans l'ensemble, pour ce qui est de la suppression des mauvaises herbes et du rendement des champs de mais, les meilleurs traitements étaient les suivants : DPX 79406 + bromoxynil + Agral 90 (0,1875 + 0,28 kg/ha + 0,2 % v/v), atrazine + C.O.C. et DPX E9636 + dicamba + Agral 90. Le composé Hoe 100063 + bromoxynil + Genapol a donné des résultats médiocres, car il n'a pas permis de supprimer les graminées annuelles qui germent plus tard. On n'a pas constaté de différences marquées entre les glyphosates Monsanto et ICI Chipman.

INTRODUCTION: Annual and perennial grasses are among the worst weeds in corn. Presently a number of preplant, preplant incorporated, preemergence, early postemergence (2-3 leaf corn) and late post (>4 corn leaf) herbicides are available for grass control. Their weak point however is perennial grasses, particularly quackgrass. Annual grasses can be controlled by a number of herbicides, but only preplant applications of glyphosate (Round-up) and high atrazine rates can reduce quackgrass competition.

Three new experimental post-emergent herbicides are currently being promoted as grass control herbicides in corn. These products, DPX 79406, HOE 100063, and DPX E9636 are reported to have post emergent activity on quackgrass when applied at the recommended grass stage. Atrazine is the only other product that can control quackgrass post emergence, but excessive rates must be used. Future rotations due to residues are therefore limited and a potential environmental hazard created.

Another option for controlling quackgrass is to apply glyphosate to emerged quackgrass before planting. Glyphosate (Round up- Monsanto) can be used in this manner. Glyphosate (Touchdown- ICI Chipman) is another product currently being developed and could also be used the same way.

If quackgrass and annual grasses can be effectively controlled by the preplant and/or new post emergent grass herbicides, yields can be expected to increase, and crop rotation problems due to excessive atrazine rates will not be a concern.

A trial was therefore established to evaluate a number of new post emergent grass herbicides with the standard atrazine and pre plant glyphosate treatments for grass control within corn.

MATERIALS AND METHODS: "Pioneer 3979" corn was planted May 29, 1991 in a trial at Centreville, Carleton Co. Soil type was a silt loam with a pH of 5.1, an organic matter content of 5% and a sand/silt/clay ratio of 39:42:19. Seeding rate was 1 seed/15 cm with a row spacing of 100 cm. 448 kg/ha of 21-00-22 and 224 kg/ha of 18-46-00 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 1m x 6m. Previous crop was field corn. Preplant (PP) herbicides (Table 1) were applied May 14 when quackgrass was at the 2-3 leaf stage. Plots were disced 14 days after the preplant applications of glyphosate. Early Post emergence (E Post) herbicides (Table 1) were applied June 14 at the two leaf corn stage and the quackgrass 3-4 leaf stage. Post emergence (Post) herbicides (see table 1) were applied June 24 at the five leaf corn stage and the quackgrass 4-5 leaf stage. PP treatments, E Post and Post treatments were applied using a CO_2 backpack sprayer in a water volume of 175 L/ha at 207 kPa of pressure. Rainfall levels were 0 mm, seven days before preplant (PP) applications and 40 mm, fourteen days after. Rainfall levels seven days before E Post applications were 82 mm, and 2 mm fourteen days after. Rainfall levels seven days before Post applications were 0 mm, and 3 mm fourteen days after. Visual assessments on crop phytotoxicity, individual grass species and overall weed control were taken June 21, July 5, July 18 and August 15.

Harvest was October 16. Logarithmic transformations were performed on yield data and arcsin transformations performed on visual observations where necessary. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

Crop injury: High levels of metolachlor + cyanazine injury (7.5 to 22.6%) was observed one week after their application (June 21). On July 5 (52 days after preplant application; 21 days after early post application; 11 days after late post application), crop injury was again evaluated. Results indicated that five treatments, DPX 79406 + bromoxynil + Agral 90 (0.025 + 0.28 kg/ha + 0.2% v/v) (28.8%), DPX 79406 + bromoxynil + Agral 90 (0.01875 + 0.28 kg/ha + 0.2% v/v) (20.0%), Hoe 100063 + bromoxynil + Genapol (0.02 + 0.28 kg/ha + 0.33% v/v) (11.3%), atrazine + C.O.C. (11.3%) and glyphosate + enhance; metolachlor + cyanazine (1.2 kg/ha + 0.5 L/ha; 2.0 + 2.0 kg/ha (11.3%) all had injury levels significantly higher than the untreated control.

Although some crop injury was evident on the July 18 assessment date no significant differences existed between treatments. On August 15 crop stunting was also observed from a number of treatments. Stunting was the result of weed competition from treatments providing poor weed control and not the result of herbicide injury, however.

Annual grass control: The trial was initially conducted to evaluate various herbicides for quackgrass control. However, annual grasses outcompeted the majority of the quackgrass and became the predominant weed species. Barnyard grass was the main annual grass present followed by foxtail.

By July 5, only four treatments, bromoxynil applied alone and the three HOE 100063 + bromoxynil + Genapol treatments resulted in control levels not significantly different from the untreated control (see table 1). Treatments resulting in over 90.0% quackgrass control were DPX E9636 + dicamba + Agral 90 (0.025+0.28kg/ha+0.2% v/v)(95.7%), atrazine + C.O.C. (91.5%), glyphosate + Agral 90 /+ metolachlor + cyanazine (1.2 kg/ha + 0.5% v/v /+ 2.0 + 2.0 kg/ha) (91.3%), and the low rate of DPX 79406 + bromoxynil + Agral 90 (90.0%).

The same treatments that resulted in poor annual grass control on July 5 also resulted in poor control on July 18 (Table 1). The most effective treatments at this time were the two DPX 79406 + bromoxynil + Agral 90 treatments.

On the last assessment date (August 15) annual grass control was broken down into foxtail and barnyard grass control. At this time three treatments resulted in significant barnyard grass control but only one, DPX 79406 + bromoxynil + agral 90 (0.01875 + 0.28 kg/ha + 0.2% v/v) (75.0%) had control levels over 70.0%.

Foxtail densities were much lower than barnyard grass, even in the untreated control plots. As a result ratings made it appear that foxtail was controlled at high levels, but it is more likely that densities were initially low. Treatments not significantly different from the untreated control were HOE 100063 + bromoxynil + Genapol (0.02 + 0.28 kg/ha), DPX E9636 + dicamba + Agral 90 (0.015 + 0.28 kg/ha+ 0.2% v/v), HOE 100063 + bromoxynil + Genapol (0.040 + 0.28 kg/ha + 0.33% v/v) and bromoxynil. The most effective treatments resulting in over 85% foxtail control were Atrazine + C.O.C. (91.3%) glyphosate + enhance /+ metolachlor and cyanazine (87.5%) and DPX 79406 + bromoxynil + Agral 90 (0.01875 + 0.22 kg/ha + 0.2% v/v) (85.0%).

Throughout the rating period, bromoxynil applied alone resulted in poor grass control. This could be expected as it is a broadleaf weed herbicide with no activity on grasses. In addition, treatments containing HOE 100063 generally resulted in poor annual grass control. HOE 100063, unlike DPX 79406 and DPX E9636 had no residual activity. Later germinating grasses were therefore not controlled.

Quackgrass control: At the time of glyphosate preplant applications (May 14), quackgrass was observed throughout the trial site. Following tillage operations and corn planting, annual grasses were the predominant weed species and outcompeted most of the quackgrass initially present. The earlier ratings did give some indication of quackgrass control, however.

On July 5th (52 days after preplant application; 21 days after e post application; 11 days after late post application) quackgrass control was evaluated. Treatments not providing quackgrass control levels significantly higher than the untreated control included the three HOE 100063 + Bromoxynil + Genapol treatments and bromoxynil applied alone. The remaining treatments controlled quackgrass from 65.3 to 95.0% and were not significantly different from one another. The most effective treatments were DPX E9636 + dicamba + Agral 90 (0.015 + 0.28 kg/ha + 0.2% v/v) (95.0%), DPX 79406 +

bromoxynil + Agral 90 (0.01875 + 0.28 kg/ha + 0.2% v/v) (93.2%), DPX E9636 + dicamba + Agral 90 (0.025 + 0.28 kg/ha + 0.2% v/v) (91.5%) and DPX 79406 + bromoxynil + Agral 90 (0.025 + 0.28 kg/ha + 0.2% v/v) (91.3%).

There were no significant differences when comparing glyphosate (Monsanto - Trts 2,14) with glyphosate (ICI Chipman - Trt 12,13). Assessments after this date were difficult since the annual grasses completely covered most plots.

Broadleaf weed control: Broadleaf weed pressure was generally light due to the high annual grasses densities. By July 18 (34 days after early post application, 24 days after post applications) all treatments significantly controlled broadleaf weeds from 80.0 to 100.0%. Only two treatments, HOE 100063 + bromoxynil + Genapol (0.04 + 0.28 kg/ha + 0.33% v/v (80.0%) and HOE 100063 + bromoxynil + Genapol (0.03 + 0.28 kg/ha + 0.33% v/v) (82.5%) provided control levels less than 90%. Between the herbicides and grass pressure, excellent broadleaf weed control resulted throughout the assessment period.

Yields: Corn was harvested October 16 with fresh weights being recorded. Yields were later converted to a 15.5% moisture equivalent for treatment comparison. Yield data indicated that five treatments, HOE 100063 + bromoxynil + Genapol at its three rates, glyphosate + enhance \+ metolachlor + cyanazine, and bromoxynil applied alone, had yields not significantly different from the untreated control. Reasons for low yields from glyphosate + enhance \+ metolachlor + cyanazine is not understood as higher yields were obtained when metolachlor+cyanazine was used with other similar treatments.

The remaining treatments had yields varying from 2.82 to 4.18 T/ha and were significantly higher than the control but not each other. The highest yielding treatments were DPX E9636 + dicamba + Agral 90 (0.015 + 0.28 kg/ha + 0.2% v/v) (4.18 T/ha), DPX E9636 + dicamba + Agral 90 (0.25 + 0.28 kg/ha + 0.2% v/v) (3.45 T/ha), atrazine + C.O.C. (3.45 T/ha), and DPX 79406 + bromoxynil + Agral 90 (0.01875 + 0.28 + 0.2% v/v) (3.26 T/ha).

CONCLUSIONS: High levels of metolachlor + cyanazine injury (7.5 to 22.6%) was observed one week after their application (June 21), but most recovered within 3 weeks. By July 5, the most phytotoxic treatments were the two DPX 79406 + bromoxynil + Agral 90 treatments. Both resulted in over 20.0% injury. Although some crop injury was still evident by July 18th, levels were not significantly different from the untreated control. Stunting observed after this time in plots was the result of weed competition and not herbicide injury.

Broadleaf weed pressure was very light due to high annual grass densities. As a result it was difficult to evaluate broadleaf weed control fairly, as weed control appeared to be excellent from all treatments.

Quackgrass control evaluations were also difficult because of the high annual grass densities. The most effective treatments however appeared to be, the low rate of DPX E9636 + dicamba + Agral 90, the low rate of DPX 79406 + bromoxynil + Agral 90, the high rate of DPX E9636 + dicamba + Agral 90 and the high rate of DPX 79406 + bromoxynil + Agral 90. Control levels were all over 90.0% from these treatments. There did not appear to be any significant differences between preplant applications of glyphosate (Monsanto - Trt 2,14) and glyphosate (ICI-Chipman -Trt 12,13) during the trial.

By July 15 the most effective annual grass control resulted from the two DPX 79406 + bromoxynil + Agral 90 treatments, followed by atrazine + C.O.C. and DPX E9636 + dicamba + Agral 90 (0.025 + 0.28 kg/ha + 0.2% v/v). By August 15 the most effective barnyard grass control treatment was DPX 79406 + bromoxynil + Agral 90 (0.01875 + 0.28 kg/ha + 0.2% v/v (75%) and the most effective foxtail treatment was atrazine + C.O.C. (91.3%). HOE 100063 treatments provided very poor annual grass control since it had no residual activity.

The highest yielding treatments were the two DPX E9636 + dicamba + Agral 90 treatments, atrazine + C.O.C. and the low rate of DPX 79406 + bromoxynil + Agral 90.

The DPX 79406 treatments generally provided good annual grass control but the higher rates caused too much initial injury, which reduced final yields. The lowest rate however provided excellent annual grass control and yields. Atrazine + C.O.C. also provided excellent weed control and yields followed by the two DPX E9636 treatments. Based on results obtained in the trial the most effective overall treatments meriting further testing would be low rates (0.01875 kg/ha and lower) of DPX 79406 + bromoxynil + Agral 90, atrazine + C.O.C. and DPX E9636 + dicamba + Agral 90. Since DPX E9636 is a component of DPX 79406 it is possible that slightly lower DPX 79406 rates would still provide excellent weed control and increased yields.

Table 1. Yield Data and Visual Ratings on Crop Injury and Weed Control in Corn

TREATMENT	RATE (kg(a.i.)/ha)	TIMING	% CROP INJURY (0-100%)			% QUACKGRASS CONTROL (0-100%)	% ANNUAL GRASS CONTROL (0-100%)		%FOXTAIL CONTROL (0-100%)	%BARNYARD CONTROL (0-100%)	BROADLEAF WEED CONTROL (0-100%)	YIELDS T/ha 15.5 % moisture	AVERAGE # PLANTS PER PLOT
			July 5	July 18	Aug. 15	July 5	July 5	July 18	Aug. 15	Aug. 15	July 18	Oct.16	Oct.16
1. Control	-	-	1.3 d *	5.0 ns	36.3 a	37.0 cd	27.0 b	30.0 c	31.3 c	17.5 def	0 b	1.06 e	22 e
2. Glyphosate + enhance; metolachlor + Cyanazine	0.9+0.5L/ha; 2.0+2.0	preplant; 2 leaf	2.5 cd	0	6.3 bc	79.5 a	83.8 a	69.5 ab	81.3 ab	31.3 bcde	98.5 a	1.79 cde	36 a
3. DPX 79406 + Bromoxynil + Agral 90	0.01875 + 0.28 + 0.2% v/v	5 leaf	20.0 b	7.0	2.5 c	93.2 a	90.0 a	97.7 a	85.0 a	75.0 a	99.3 a	3.26 ab	33 ab
4. DPX 79406 + Bromoxynil + Agral 90	0.025 + 0.28 + 0.2% v/v	5 leaf	28.8 a	14.5	3.8 c	91.3 a	85.7 a	95.7 ab	81.3 ab	58.8 ab	98.2 a	2.82 abcd	31 ab
5. HOE 100063 + Bromoxynil + Genapol	0.020 + 0.28 + 0.33% v/v	5 leaf	11.3 c	10.0	22.5 ab	50.0 bc	38.8 b	17.5 c	63.8 abc	0 f	95.5 a	1.83 bcde	28 abcd
6. HOE 100063 + Bromoxynil + Genapol	0.030 + 0.28 + 0.33% v/v	5 leaf	6.3 cd	7.5	21.5 ab	22.5 cd	22.5 b	18.8 c	73.8 ab	8.8 def	82.5 a	1.76 cde	24 bcde
7. HOE 100063 + Bromoxynil + Genapol	0.040 + 0.28 + 0.33% v/v	5 leaf	7.5 cd	12.5	26.3 ab	17.5 d	27.5 b	6.3 c	56.3 abc	3.8 ef	80.0 a	1.96 bcde	20 de
8. DPX E9636 + Dicamba + Agral 90	0.015 + 0.28 + 0.2% v/v	2 leaf	0 d	0	0 c	95.0 a	87.5 a	75.7 ab	60.0 abc	6.3 ef	97.7 a	4.18 a	31 ab
9. DPX E9636 + Dicamba + Agral 90	0.025 + 0.28 + 0.2% v/v	2 leaf	1.3 d	3.8	1.3 c	91.5 a	91.5 a	83.2 ab	79.5 ab	23.8 cdef	96.5 a	3.45 a	30 abc
10. Atrazine + Corn Oil Concentrate	2.25 + 2.5 L/ha	5 leaf	11.3 c	9.5	3.8 c	88.2 a	95.7 a	86.3 ab	91.3 a	51.3 abc	100.0 a	3.45 a	37 a
11. Bromoxynil	0.280	5 leaf	5.0 cd	12.0	20.8 ab	33.8 cd	35.0 b	10.0 c	46.3 bc	0 f	90.0 a	1.44 de	22 cde
12. Glyphosate + Enhance; metolachlor + Cyanazine	1.2 + 0.5L/ha; 2.0 + 2.0	Preplant; 2 leaf	11.3 bc	6.3	2.5 c	70.3 ab	76.5 a	67.0 b	87.5 a	30.0 cde	96.5 a	2.84 abcd	33 ab
13. Glyphosate + Agral 90; Metolachlor + Cyanazine	1.2 + 0.5%; 2.0 + 2.0	Preplant; 2 leaf	6.3 cd	2.5	1.3 c	83.8 ab	91.3 a	82.5 ab	66.3 ab	37.5 bcd	99.3 a	3.06 abc	34 ab
14. Glyphosate; Metolachlor + Cyanazine	0.9; 2.0 + 2.0	Preplant; 2 leaf	7.5 cd	2.5	6.3 bc	65.3 ab	83.8 a	70.0 ab	81.3 ab	12.5 def	97.3 a	3.21 abc	34 ab

* Means with the same letter are not significantly different at the 0.5 level of significance according to the Duncan's Multiple Range Test.

EVALUATION OF VARIOUS HERBICIDES FOR WILD OAT AND BROADLEAF WEED CONTROL IN BARLEY

K.V. McCully, Y. Martineau, M.A. Mann and D.O. Hanscomb

ABSTRACT: A trial to evaluate various herbicides for wild oat and broadleaf weed control in Leger barley was conducted. Visual rating on weed control and crop tolerance were collected, in addition to crop height measurements. Results indicated that initial crop injury was evident two weeks after application, but by August 1 (61 days after application) no significant injury was observed from any treatment. Although crop height measurements varied throughout the assessment period, differences were never significant. Wild oat control was lower than expected from all treatments. Control levels ranged from 45% to 75% and were not significantly different from one another by the final August 1 assessment. The three most effective wild oat treatments were ICIA 0604+DPX R9674 + S.O.C. (75%), HOE 046360/HOE 070542 + 2,4-D + bromoxynil (72.5%), and diclofop methyl (71.25%). Treatments containing DPX R9674 or thifensulfuron methyl provided excellent chickweed control. Overall the best treatments in terms of wild oat and chickweed control, crop tolerance and crop height were ICIA 0604 + DPX R9674 + S.O.C., ICIA 0604+ DPX R9674 + Merge, diclofop methyl + thifensulfuron methyl and diclofop methyl + DPX R9674.

ÉVALUATION DE DIVERS HERBICIDES POUR LA SUPPRESSION DE LA FOLLE AVOINE ET DES COTYLÉDONES DANS LES CULTURES D'ORGE

K.V. McCully, Y. Martineau, M.A. Mann et D.O. Hanscomb

RÉSUMÉ : Des essais seront effectués afin d'évaluer divers herbicides pour la suppression de la folle avoine et des cotylédones dans les cultures d'orge de la variété Leger. On a effectué des évaluations visuelles de la suppression des mauvaises herbes et de la tolérance des cultures et mesuré la hauteur des plants. Deux semaines après les traitements, on a constaté des dommages évidents aux cultures, mais au 1^{er} août (61 jours après les traitements), on n'a remarqué aucun dommage important causé par l'un des traitements. La hauteur des plants variait durant toute la période d'évaluation, mais aucun écart important n'a été constaté. Tous les traitements ont entraîné un taux de répression de la folle avoine inférieur à celui prévu. Ce taux variait entre 45 et 75 % et ne différait pas tellement d'un traitement à l'autre lors de la dernière évaluation, le 1^{er} août. Les trois composés les plus efficaces pour la suppression de la folle avoine sont les suivants : ICIA 0604 + DPX R9674 + S.O.C. (75 %); HOE 046360/HOE 070542 + 2,4-D + bromoxynil (72,5 %); et diclofop-méthyl (71,25 %). Les composés qui contiennent du DPX R9674 ou du thifensulfuron-méthyl offrent un excellent taux de suppression du mouron des oiseaux. Dans l'ensemble, les meilleurs traitements pour la suppression de la folle avoine et du mouron des oiseaux, compte tenu de la tolérance des cultures et de la hauteur des plants, étaient les suivants : ICIA 0604 + DPX R9674 + S.O.C.; ICIA 0604 + DPX R9674 + Merge; diclofop-méthyl + thifensulfuron-méthyl; et diclofop-méthyl + DPX R9674.

INTRODUCTION: Wild oats are by far the most serious annual weed of cultivated fields in Western Canada. Virtually every hectare of land planted to cereals must be treated with a wild oat herbicide. Crop yield reductions can be significant even when infestations are considered light. Despite control efforts wild oats continue to thrive.

Presently, approximately 3000 acres of grain in the St. Quentin area of New Brunswick are infested. These infestations appear to be multiplying and spreading. This weed must be prevented from spreading to other areas of New Brunswick.

Wild oats are very competitive, and as a result pose a threat to grain producers in the province. Reasons for wild oat success in surviving and spreading is its ability to grow rapidly early in the spring, mature and drop its seed before grain harvest. Wild oats also possess a high degree of dormancy as up to 95% of the seeds are dormant at the time of harvest. A large percentage of dropped seeds will germinate within one year, but some may remain dormant for four to seven years.

Losses from wild oat, such as yield reduction, cleaning costs and lowering of grade and quality are well recognized. Further yield losses can also result when broadleaf weeds are present. A trial was therefore conducted to evaluate various herbicide combinations for wild oat and broadleaf weed control in barley.

MATERIALS AND METHODS: "Leger" barley was planted at a seeding rate of 148 kg/ha and row width of 18 cm May 11, 1991 in St. Quentin, Restigouche County. The soil was a silt loam with a pH of 5.7, an organic matter content of 5% and a sand:silt:clay ratio of 32:47:21. 336 kg/ha of 19-19-19 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 6m. Previous crop was barley. Post emergence (POST) herbicides (Table 1) were applied June 6 at the barley 2-3 leaf stage and wild oat 2 leaf stage. Broadleaf weeds were 2-3 cm high. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 150 L/ha at a pressure of 207 kPa. Rainfall was 1 mm, seven days before application and 35mm, fourteen days after. Visual ratings on crop phytotoxicity and weed control were collected June 20, July 4 and August 1. (Barley was harvested accidentally by farmer and yield data was unavailable). Arcsin transformations were performed on visual evaluations where necessary. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

Crop injury: Fourteen days after treatments were applied, visual crop injury was assessed and crop height measurements collected. Results indicated that all treatments provided some visual crop injury, but none more than 10% (Table 1). Treatments containing HOE 046360/HOE 070542 were the three most phytotoxic treatments. Treatments with injury levels not significantly different from the untreated control included diclofop methyl + bromoxynil (1.75%), diclofop methyl + thifensulfuron (2.0%), imazamethabenz (2.0%), imazamethabenz + MCPA amine (2.25%), and ICIA 0604 + DPX R9674 + merge (2.25%).

By July 4 (34 days after application), all treatments recovered, as none of the treatments had injury levels significantly higher than the untreated control.

Although crop height measurements varied throughout the assessment period, differences between treatments were never significant, further indicating good crop tolerance.

Weed control: The two predominant weeds at the trial site were wild oats and chickweed. Other weeds present but not consistently throughout the area, were perennial sowthistle and Canada thistle.

Wild oats: By the first assessment date (June 20), only three treatments, imazamethabenz + MCPA (1.25%), Imazamethabenz (5.00%) and HOE 046360/HOE 070542 + 2,4-D + DPX R9674 (8.75%) resulted in control levels not significantly different from the control (Table 1). The remaining treatments provided control levels between 27.5 and 73.75%. The four most effective treatments at this time were diclofop methyl + thifensulfuron methyl (73.75%), difenzoquat + DPX R9674 (62.5%), HOE 046360/HOE 070542 + 2,4-D (58.75%) and difenzoquat + bromoxynil/MCPA (56.25%). Control levels were lower than what could be accepted on a commercial basis.

By July 4th the only treatment not significantly different from the untreated control was imazamethabenz (Table 1). The remaining treatments provided wild oat control levels between 35 and 70%. Control levels were still considered too low and unacceptable.

By the final assessment on August 1, all treatments significantly controlled wild oats as compared to the untreated control. Control levels from the various treatments ranged from 45.0 to 75.0%, but were not significantly different from one another. Treatments providing over 70% wild oat control included, ICIA 0604 + DPX R9674 + S.O.C. (75%), HOE 046360/HOE 070542 + 2,4-D + bromoxynil (72.5%) and diclofop methyl (71.25%).

Although differences were not significant by the last assessment date, DPX R9674 was the least effective of the herbicides tank mixed with diclofop methyl. ICIA 0604 + DPX R9674 + S.O.C. was more effective than ICIA 0604 + DPX R9674 mixed with Merge but differences were not significant. HOE 046360/HOE 070542 + 2,4-D + bromoxynil was the most effective of the three treatments containing HOE 046360/HOE 070542, but differences were not significant.

Chickweed: By the first assessment date (June 20), only diclofop methyl and imazamethabenz applied alone resulted in chickweed control levels not significantly higher than the untreated control (Table 1). This could be expected as diclofop methyl has no activity on broadleaf weeds and imazamethabenz activity is limited. Treatments containing DPX R9674 or thifensulfuron all controlled chickweed over 75%, indicating their excellent activity on chickweed. The same trends existed through to the last rating taken on August 1. At this time, all treatments containing DPX R9674 and thifensulfuron had chickweed control levels over 85.0%.

CONCLUSIONS: Although eight treatments resulted in significant visual crop injury by the first June 20 assessment date (14 days after application), all treatments recovered and were not significantly different from the untreated control by August 1. Crop height measurements varied between treatments throughout this same period, but differences were never significant. Based on visual observations, leger barley was therefore considered tolerant to all the treatments tested. Yield data was not available to further support this, however.

None of the treatments provided excellent wild oat control, due possibly to the high temperatures and unusually low moisture. Final control levels ranged from 45% to 75% for all treatments but differences were not significant from each other. Only three treatments ICIA 0604 + DPX R9674 + S.O.C. (75%), HOE 046360/HOE 070542 + 2,4-D + bromoxynil (72.5%) and diclofop methyl (71.25%), resulted in wild oat control over 70.0%.

All treatments containing DPX R9674 or thifensulfuron methyl resulted in excellent chickweed control. Overall the best treatments in terms of wild oat and chickweed control, crop tolerance and crop height were ICIA 0604 + DPX 9674 + S.O.C., ICIA 0604 + merge, diclofop methyl + thifensulfuron methyl and diclofop methyl + DPX R 9674.

Table 1. Barley Heights and Visual Ratings on Crop Injury and Weed Control

TREATMENT	RATE kg(a.i) /ha	% CROP INJURY June 20 July 4 Days after Application 14	36	HEIGHTS (cm) June 20 July 4 August 1 Days after application 14	36	61	% WILD OAT CONTROL June 20 July 4 Aug 1 Days after applic. 14	36	61	% CHICKWEED CONTROL June 20 July 4 Aug.1 Days after application 14	36	61
Control	-	0 d [a]	0 ns	33.50 ns	59.00 ns	92.50 ns	0 c	0 c	0 b	0 c	0 d	0 e
diclofop methyl	0.80	4.00 abc	0	34.00	63.00	104.25	52.5 ab	55.00 a	71.25 a	10.00 de	17.50 d	11.25 e
diclofop methyl + bromoxynil	0.80 + 0.28	1.75 cd	0.5	32.25	58.75	98.25	52.5 ab	65.00 a	60.00 a	32.50 cd	46.25	47.50 bc
diclofop methyl + DPX R 9674	0.80 + 0.015	3.00 abc	2.75	32.00	52.50	98.50	28.75 bcd	35.00 ab	45.00 a	82.50 ab	90.00 a	87.50 a
diclofop methyl + thifensulfuron	0.80 +0.015	2.00 abcd	0.50	34.50	60.00	96.50	73.75 a	60.00 a	62.50 a	82.50 ab	90.00 a	90.00a
imazamethabenz	0.45	2.00 cd	4.50	31.50	53.75	89.25	5.00de	17.50 bc	45.00 a	20.00 cde	4.25 d	15.00 e
imazamethabenz + MCPA amine	0.45 + 0.56	2.25 abcd	2.50	32.75	60.25	95.00	1.25 e	41.25 a	60.00 a	53.75 abc	71.25 abc	82.50 a
ICIA 0604 + DPX R9674 + S.O.C.	0.25 + 0.015 + 1% v/v	3.00 abc	2.00	33.00	59.25	99.25	40.00 abc	70.00 a	75.00 a	82.50 ab	90.00 a	90.00 a
ICIA 0604 + DPX R9674 + Merge	0.25 + 0.015 + 0.5% v/v	2.25 bcd	0	32.75	62.00	99.50	27.50 bcd	55.00 a	65.00 a	81.25 ab	90.00 a	86.25 a
Difenzoquat + bromoxynil/ MCPA	0.75 + 0.56	7.50 abc	4.75	34.00	59.25	96.50	56.25 ab	55.00 a	60.00 a	36.75 cd	65.00 abc	76.25 ab
Difenzoquat + DPX R9764	0.75 + 0.015	5.25 abc	4.00	32.25	55.25	96.25	62.50 ab	60.00 a	60.00 a	87.50 a	90.00 a	90.00 a
HOE 046360/HOE 070542 + 2,4-D	0.1/0.05 + 0.14	9.25 a	3.75	34.00	58.25	100.75	58.75 ab	42.50 a	52.50 a	52.50 abc	48.75 bc	68.75 abc
HOE 046360/HOE 070542 + 2,4-D + DPX R 9674	0.1/0.05 + 0.14 + 0.015	8.75 ab	1.25	31.25	58.00	92.75	8.75 cde	45.00 a	51.25 a	77.50 ab	80.00 ab	85.00 a
HOE 046360/HOE 070542 + 2,4-D + Bromoxynil	0.1/0.05 + 0.14 + 0.28	9.25 a	1.75	35.00	65.50	98.00	42.50 abc	67.50 a	72.50 a	41.25 bcd	50.00 bc	67.50 abc

[a] Means with the same letter are not significantly different at the 0.5 level of significance according to the Duncan's Mutliple Range Test.
Visual Ratings are expressed as a percentage (0-100%)

HERBICIDE EVALUATION TRIAL FOR WEED CONTROL IN PROCESSING PEAS

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ABSTRACT: A trial to evaluate weed control and crop tolerance from registered and experimental herbicides on processing peas was conducted. Weed control and crop injury ratings were collected, in addition to maturity ratings and crop yields. Crop tolerance was generally excellent as only two treatments, clomazone (ppi) applied May 23, and imazethapyr +agral 90 +28-00-00 (post) applied June 24, displayed pea injury symptoms by the July 5 assessment date. By harvest no visual foliar injury was observed from any treatment. The imazethapyr+agral 90 +28-00-00 treatment did result in yields significantly lower than the untreated control however,indicating that the earlier visible injury affected pod and pea production. Weed densities and composition was variable and inconsistent making weed control evaluations difficult. The best overall treatment in terms of yields and pea maturity was imazethapyr applied pre-emergence at 0.1 kg/ha. No significant yield or maturity differences existed between the different water volumes evaluated with the MCPA amine treatments, the Na salt treatments or the MCPB/MCPA treatments. In addition, these three treatments and their various water volumes were not significantly different from one another.

ÉVALUATION D'HERBICIDES POUR LA SUPPRESSION DES MAUVAISES HERBES DANS LES CHAMPS DE POIS DE TRANSFORMATION

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RÉSUMÉ : On a effectué des essais afin d'évaluer l'efficacité et la tolérance par les cultures d'herbicides enregistrés ou au stade expérimental dans des champs de pois de transformation. On a mesuré la suppression des mauvaises herbes, les dommages causés aux cultures, la maturité des récoltes et le rendement. En général, la tolérance des cultures a été excellente, car seuls deux traitements, celui au clomazone (incorporé au sol avant la plantation) appliqué le 23 mai et celui à l'imazethapyr + Agral 90 + 28-00-00 (postlevée) appliqué le 24 juin, avaient causé des dommages aux pois constatés lors de l'évaluation du 5 juin. Au moment de la récolte, on n'a constaté aucun dommage causé par l'un des traitements. Le traitement à l'imazethapyr + Agral 90 + 28-00-00 a entraîné des rendements considérablement moins élevés que dans les parcelles témoins non traitées, ce qui permet de supposer que les dommages remarqués plus tôt ont influé sur la production des cosses et des pois. Les espèces et la densité des mauvaises herbes variaient beaucoup, ce qui a compliqué l'évaluation de l'efficacité des herbicides. Dans l'ensemble, le meilleur traitement du point de vue rendement et maturité des pois était celui à l'imazethapyr (prélevée) selon une dose de 0,1 kg/ha. On n'a constaté aucun écart important dans le rendement ou la maturité entre les différents volumes d'eau évalués dans les traitements de MCPA-amine, de sel de sodium ou de MCPB/MCPA. En outre, les résultats de ces trois herbicides mélangés avec divers volumes d'eau ne différaient pas tellement.

INTRODUCTION: With the banning of dinoseb in New Brunswick last year, pea growers lost a very effective and consistent herbicide. As a result there has been demand to find an effective alternative as soon as possible. A trial was therefore conducted to evaluate various registered and experimental products on weed control and crop tolerance. The trial was conducted as a follow up from trials conducted during the past two years (see McCully et.al., Adaptive Research Reports 1989 and 1990).

MCPA has been identified as a possible alternative to dinoseb but some crop injury has been reported in previous years. MCPA amine, MCPA NA , and MCPB/MCPA were therefore evaluated at different water volumes to determine if reported crop injury could be reduced. In order to determine the most effective treatment, these treatments were compared against each other and the remaining treatments in the trial.

MATERIALS AND METHODS: "Bolero" peas were planted May 23, 1991 in a trial at Florenceville, Carleton County. Soil type was a silt loam with a pH of 5.8 and an organic matter level of 3.0%. Seeding rate was, 120 seeds per $1m^2$ with a row spacing of 18 cm. 336 kg/ha of 15-15-15 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 3m x 6m. Previous crop was potato. Preplant incorporated (ppi) herbicides (Table 1) were applied May 23 and incorporated 7.5 cm with a roto-tiller. Preemergence (PRE) herbicides (Table 1) were applied May 29. Post-emergence (POST) herbicides (Table 1) were applied June 24 when the peas had 3-4 pairs of leaves and weeds were 15-18 cm high. Herbicides were applied using a CO_2 handheld sprayer in a water volume of 200 or 250 L/ha for ppi applications and 250 L/ha for PRE applications. POST treatments were applied in a water volume of 250 L/ha, except for MCPA compounds which were applied in water volumes of 150 L/ha or 300 L/ha (Table 1). Sprayer pressure was 207 kPa. Rainfall was 17 mm seven days before ppi applications and 78 fourteen days after. Rainfall was 78 mm seven days before PRE application, and 3 mm fourteen days after. Rainfall levels seven days before POST application were 6 mm and 10 mm + 0 mm seven and fourteen days after. Visual assessments on crop phytotoxicity and weed control were taken June 24, July 5, and July 25, 1991. Harvest was July 26, 91. Tenderometer readings were collected at harvest to give an indication of pea maturity between treatments. Tenderometer readings express the amount of resistance a sample exerts while under pressure. Logarithmic transformations were performed on yield data and arcsin transformations were performed on visual observations where necessary. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

Crop injury: Some early crop injury was observed from the pre plant incorporated(ppi) treatments at the June 24 assessment date (post treatments had not been applied yet). Ethalfluralin and clomazone resulted in 17.5% foliar injury followed by the two treatments containing trifluralin with 7.5 and 3.8% injury respectively. By the July 5 assessment date only clomazone (10.0%) and imazethapyr+agral 90+ 28-00-00 (7.5%) resulted in pea injury (Table 1). Clomazone injury was in the form of a white bleaching while imazethapyr+agral 90 +28-00-00 resulted in crop stunting. By the final July 25 assessment date no visual foliar injury was observed from any treatment. Pea maturity readings and low yields however indicated that the imazethapyr +agral 90 +28-00-00 treatment did affect pod and pea production.

Weed control: A number of weeds were present at the trial site but were not consistent from plot to plot or replicate to replicate. Weeds present in the plots included lamb's quarters, barnyard grass, lady's thumb, pineapple weed, cudweed,hempnettle,wild buckwheat and clover. The only weeds found consistently from plot to plot however were lamb's quarters and lady's thumb.

Lamb's quarters: Results from the July 25 assessment date indicated that most all treatments could effectively control lambs quarters (Table 1). Treatments providing less than 75.0% weed control however, included MCPA NA (150 l water/ha) (73.0%), MCPA amine (150 l water/ha) (68.0%), dinoseb (65.0%), trifluralin (63.0%) and imazethapyr(pre) (28.0%). Dinoseb and trifluralin provided good early season lambs quarters control (86.3% and 78.8% on July 5), but control was short lived. The remaining treatments provided control levels from 75.0% to 100.0%

Treatments resulting in over 95% control by the July 25 assessment date included, MCPB/MCPA (150 l water/ha) (100.0%), metribuzin 0.21 kg/ha (100.0%), trifluralin;MCPA (100.0%), BAS 35140 + imazethapyr(0.84 + 0.05 kg/ha) (100.0%), MCPA amine + crop booster (98.0%), MCPB/MCPA (300 l/ha) (95.0%) and metribuzin 0.28 kg/ha (95.0%). In addition there were six other treatments providing over 80% lambs quarters control.

Overall, metribuzin applied post emergence provided better lamb's quarters control than pre emergence treatments. MCPA amine and MCPA Na when applied in 300 l/ha resulted in better lambs quarters control than when applied in 150 l/ha. The higher water volume may have resulted in better spray coverage on lamb's quarters thereby resulting in higher control levels. Differences were not significant, however. MCPB/MCPA did not follow this trend however, as the lower water volume was more effective. Differences were not significant however.

Lady's thumb: All treatments resulted in excellent lady's thumb control. Control ranged from 79.0% to 100% for all treatments during the July 5 assessment date, and 95.0% to 100% by the July 25 assessment date. Initial lady's thumb densities were low, however.

Other weeds: The remaining weeds found in plots were variable and inconsistent throughout the trial area making valid conclusions difficult. Although not conclusive a few comments will be made on weeds which did not appear to be controlled by particular treatments. This does not insinuate that the remaining treatments do control the weeds, however.

Pineappleweed and cudweed for example do not appear to be effectively controlled by ethalfluralin and trifluralin. Barnyard grass was not controlled by treatments containing MCPA amine,MCPA Na, MCPB/MCPA or bentazon +assist. This was expected as these treatments control only broadleaf weeds. The remaining weeds observed in plots were too scattered and inconsistent to draw any accurate conclusions from.

Yields and tenderometer readings: Although 17 treatments resulted in yields higher than the control only one, imazethapyr(pre) was significantly higher. This treatment had a yield of 4.7 t/ha and a pea maturity equivalent to the untreated control, thereby indicating excellent pea tolerance. Imazethapyr + agral 90 + 28-00-00 applied post emergence however, resulted in very low yields(0.08 t/ha) and was the only treatment with yields significantly lower than the control. Visual foliar injury from this treatment was not noticeable at harvest time, but pod and pea sizing was affected.

Other high yielding treatments included metribuzin 0.42 kg/ha pre (4.5 t/ha), bentazon + assist (4.2 t/ha), MCPA + crop booster (4.2 t/ha), and dinoseb (4.2 t/ha). These treatments, with the exception of MCPA + crop booster, did not affect pea maturity as compared to the control. It is probable that the fertilizer in the Crop Booster caused more initial foliar and root growth, and as a result delayed maturity. By delaying harvest until the pea maturity reached the desired level, it is possible that yields may have increased enough from this treatment to be the highest.

Overall it was found that metribuzin applied pre-emergence resulted in higher yields and tenderometer readings than the two metribuzin post treatments. Differences were not significant however. There were no yield or maturity differences when MCPA amine was applied in either 150 or 300 litres of water per hectare. As previously mentioned, the addition of crop booster to MCPA did delay pea maturity.

Although differences were not significant, MCPA Na applied in 300 l/ha of water resulted in higher yields and less maturity delay than when applied in 150 l/ha of water. MCPB/MCPA applied in 150 l/ha of water resulted in higher yields, but delayed pea maturity as compared to when applied in 300 l/ha of water. Reasons for this delay in maturity is not understood.

CONCLUSIONS: Crop tolerance was excellent from most all treatments. Only imazethapyr + agral 90 + 28-00-00 and clomazone resulted in injury symptoms by the July 5 assessment date. By the final assessment (July 25) no foliar injury was observed from any treatment, but imazethapyr + agral 90 + 28-00-00 yields and maturity readings indicated that pea and pod sizing were affected.

Weed densities and composition was variable throughout the trial site making weed control evaluations difficult. Generally most all treatments provided excellent weed control. Treatments providing poor lambs quarters control however, included imazethapyr 0.1 kg/ha, MCPA amine applied in 150 l/ha of water, trifluralin, and dinoseb. The remaining treatments all provided excellent weed control (73.0 to 100.0%) by the final assessment.

Yield and tenderometer results indicated that the best overall treatment was imazethapyr applied pre-emergence at 0.1 kg/ha (4.7 t/ha). High yields also resulted from metribuzin 0.42 kg/ha pre (4.5 t/ha), bentazon + assist (4.2 t/ha), dinoseb (4.2 t/ha), and MCPA amine + crop booster (4.2 t/ha). Tenderometer readings were also high for these treatments with the exception of the MCPA + crop booster treatment. It is probable that the fertilizer in the crop booster delayed crop maturity by initially putting more energy into root and foliar growth. By delaying harvest until the peas reach the desired maturity it is possible that yields from this treatment may have been the highest. Imazethapyr + agral 90 + 28-00-00 was the only treatment resulting in yields significantly lower than the control.

Overall there were no significant yield or tenderometer differences between MCPA amine, MCPA Na, or MCPB/MCPA treatments. MCPA amine yields were however the highest. No significant yield or tenderometer differences resulted when the various MCPA treatments were applied in different water volumes. There were some indications that the higher water volumes may have contributed to increased weed control, however.

In terms of yields and maturity, metribuzin applied pre emergence was better than the metribuzin post-emergence treatments. Lambs quarters control was however less from the pre application. Differences between these treatments were not significant however.

More work should be conducted with imazethapyr applied pre-emergence, and MCPA + Crop Booster.

Table 1. Yields,Maturity Ratings and % Visual Ratings on Crop Injury and Weed Control in Peas

TRT	RATE KG (a.i.)/ha	Timing	Water Volume L/ha	% Crop Injury July 5	Lamb's Quarters % Control July 5	Lamb's Quarters % Control July 25	Lady's Thumb % Control July 5	Lady's Thumb % Control July 25	Tender-ometer July 25	Yields T Ha July 25
check	-	-	-	0 b*	0 b	0 c	0 d	0 b	101a	3.4 bc
metribuzin	0.21	post	250	0 b	100 a	100 a	98 ab	100 a	97 a	4.0 abc
metribuzin	0.28	post	250	0 b	99.0 a	95 a	100 a	100 a	96 ab	4.0 abc
metribuzin	0.42	pre	250	0 b	68.0 bcdefg	75 a	99 ab	100 a	99 a	4.5 ab
imazethapyr	0.1	pre	250	0 b	41.0 g	28 bc	96 ab	100 a	101 c	4.7 a
imazethapyr + Agral 90 + 28-0-0	0.1 + 0.25% + 2L/ha	post	250	7.5 a	74.0 abcdef	90 a	94 abc	100 a	23 c	0.08 d
bentazon + assist	1.1 + 2.0 L/ha	post	250	0 b	100 a	78 a	98 ab	100 a	101 a	4.2 abc
Bas 35140 + imazethapyr	0.6+0.05	post	250	0 b	99 a	83 a	100a	100 a#	97 a	3.6 abc
Bas 35140 + imazethapyr	0.84 + 0.05	Post	250	0 b	100 a	100 a	100a	100 a	99 a	4.1 abc
MCPA amine	0.275	post	150	0 b	45 fg	68 ab	90 abc	100 a	98 a	4.1 abc
MCPA amine	0.275	post	300	0 b	78 abcde	85 a	79 c	100 a	98 a	4.1 abc
MCPA Amine + Crop Booster	0.275 + 4L/ha	post	300	0 b	60 defg	98 a	93 abc	100 a	90 ab	4.2 abc
MCPA Na	0.38	post	150	0 b	54 efg	73 a	83 bc	100 a	96 ab	3.4 bc
MCPA Na	0.38	post	300	0 b	75 abcde	90 a	91 abc	100 a	100 a	3.7 abc
MCPB/MCPA	1.7	post	150	0 b	75 abcde	100 a	89 abc	100 a	94 ab	4.0 abc
MCPB/MCPA	1.7	post	300	0 b	66 cdefg	95 a	88 abc	100 a	99 a	3.6 abc
Trifluralin; MCPA amine	0.8 + 0.25	ppi; post	250	0 b	86 abcd	100 a	98 ab	100 a	93 ab	3.2 c
ethalfluralin	0.85	ppi	200	0 b	93 abc	88 a	90 ab	100 a	72 b	3.1 c
clomazone	0.75	ppi	250	10.0 a	98 ab	90 a	100 a	100 a	97 a	3.7 abc
Trifluralin	0.8	ppi	250	0 b	79 abcde	63 ab	98 ab	95 a	94 ab	4.0 abc
dinoseb	3.7	pre	250	0 b	86 abcd	65 ab	83 bc	100 a	102 a	4.2 abc

*Means followed by the same letter are not significantly different at the 0.05 level of significance according to the Duncan's Multiple Range Test. Visual Ratings are expressed as a percentage (0-100%)

BIOLOGICAL CONTROL OF SELECTED WEEDS IN NEW BRUNSWICK

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ABSTRACT: A number of insects were released on five different weed species throughout New Brunswick. (I) Tansy Ragwort: Tyria jacobaea larvae (Cinnabar moth) were collected and distributed at 3 locations in N.B. where they actively fed. 190 Longitarsus jacobaeae fleabeetles were released and will be monitored. Previously released beetles were found feeding last October. Approximately 4,000 Cochylis atricapitana larvae were released by spreading out infested plants in an infested field. By late summer, larvae were found in established Tansy Ragwort roots. (II) Canada Thistle: A total of 1100 Urophora cardui (stem gall fly) were released over 7 sites throughout N.B. in early spring. By August, galls had been formed at all sites. Only 27% of the formed galls were main shoot galls however. 197 adult weevils of Ceutorhynchus litura were released and feeding damage was later observed. 300 adult weevils of Larinus planus were released and later found in unopened thistle seed heads. (III) St. John's Wort: 3000 Chrysolina sp. adult beetles were collected from N.S. and and previous N.B. release sites and distributed at three locations in N.B. 2000 adults and nymphs of Aphis chloris were released at one location and will be monitored. No Anaitis plagiata were observed from last year's releases. (IV) Perennial Sow Thistle: 1268 Liriomyza sonchi pupae were released at 1 location. There were no indications of establishment. Cystiphora sonchi were also released (209 pupae, 4380 larvae) and formed numerous galls on the leaves. An average of 8 galls were found on leaves where present. (V) Toadflax: 169 Gymnaetron antirrhini adults were released in addition to 410 Brachypterolus pulicarius at one site. Gymnaetron and Calophasia lunula from previous releases at this same site were observed in the summer.

LUTTE BIOLOGIQUE CONTRE LES MAUVAISES HERBES AU NOUVEAU-BRUNSWICK

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RÉSUMÉ : On a répandu des insectes afin de lutter contre cinq diverses espèces de mauvaises herbes au Nouveau-Brunswick. (I) Séneçon jacobée : On a ramassé des larves de Tyria jacobaea (articiide cinabre) et on les a répandues dans trois endroits du Nouveau-Brunswick où elles se sont nourries activement. On a relâché 190 altises Longitarsus jacobaea qui seront observées. En octobre dernier, on a trouvé des colonies d'altises relâchées auparavant. On a relâché environ 4 000 larves Cochylis atricapitana en les répandant dans les champs envahis par le séneçon jacobée. À la fin de l'été, on a trouvé des larves dans des tiges enracinées du séneçon jacobée. II) Chardon des champs : on a répandu au début du printemps un total de 1 100 Urophora cardui dans sept différents endroits au Nouveau-Brunswick. En août, on a trouvé des galles aux sept endroits. Toutefois, seulement 27 % des galles s'étaient attaquées aux tiges principales. On a relâché 197 otiorhynques adultes de Ceutorhynchus litura et observé plus tard les dommages causés par ces insectes. On a mis en liberté 300 otiorhynques adultes de Larinus planus et on les a trouvés ensuite dans les têtes non ouvertes de graines de chardon. (III) Millepertuis commun : On a ramassé en Nouvelle-Écosse et à divers sites précédents au Nouveau-Brunswick 3 000 coléoptères adultes Chrysolina et on les a répandus dans trois endroits au Nouveau-Brunswick. On a relâché à un seul endroit 2000 adultes et nymphes Aphis chloris en vue de les observer plus tard. On n'a pas trouvé de traces des Anaitis plagiata relâchés l'année auparavant. (IV) Laiteron des champs : On a répandu dans un endroit 1268 pupes Liriomyza sonchi. On n'a observé aucun signe de colonisation par ces insectes. On a également relâché des Cystiphora sonchi (209 pupes et 4380 larves) qui ont formé de nombreuses galles sur les feuilles. On a trouvé en moyenne huit galles par feuille atteinte. (V) Linaire vulgaire : On a relâché dans un endroit 169 Gymnaetron antirrhini adultes en plus de 410 Brachypterolus pulicarius. On a observé durant l'été la présence de Gymnaetron et de Calophasia lunula relâchés auparavant au même endroit.

INTRODUCTION: Biological weed control is the deliberate use of natural enemies to reduce populations of a target weed below an acceptable level. Traditionally insects have been used, but there have been many advances made from the use of plant pathogens. In New Brunswick, imported insects are being dispersed to help control various weeds.

Biological control does not produce immediate results but it has the potential to provide a permanent solution for persistent problems. Weed eradication is not necessarily the aim. As long as the vigour is reduced sufficiently to make it non-competitive, the agent is considered successful. Some of the targeted weeds are actually desired in order for insect populations to maintain themselves.

Approximately 75% of the weeds considered of economic importance in North America have been introduced from other continents. Back in the weeds native homeland it may not be as big of a threat, because native insects provide natural control. As a result many of these insects have been identified and imported to Canada. The insects are then quarantined and undergo a rigorous testing program to ensure they will not injure desirable plants and crops if later released. This method of weed control is known as Classical Biological Weed Control, and is the basis of the program in New Brunswick.

In order to help ensure successful control of a target weed, it is beneficial to try and establish as many different insects as possible on the weed. Total dependence is therefore not placed on any one insect. The different insects released on each weed generally attack different parts. For example, 3 different insects that would attack either the roots, foliage and/or flower/seed heads would be considered ideal, and decrease the chances of the weed survival.

RESULTS & DISCUSSION:

I) Tansy Ragwort

Tansy ragwort is an introduced biennial or short lived perennial which is poisonous to cattle and horses. It contains alkaloids which can be ingested when eaten fresh or when found in hay or silage. Tansy ragwort poisoning is often difficult to diagnose because it has a latent period of one to five months at which time it causes vascular and neuromuscular damage. In Prince Edward Island, 42-52 cattle deaths were suspected in 1981. In addition to tansy ragwort containing poisonous alkaloids it can also be very competitive. Some reports indicate that 40-50% forage loss from competition is possible.

A) Releases and Observations:

1) Longitarsus jacobaeae (root mining fleabeetle) -feeds on roots and leaves.

-190 adults were released in Sussex on May 16, 1991. Feeding damage was observed in November, but no insects were observed.

2) Cochylis atricapitana (root crown feeding moth)
- feeds on flowers, flower stalks, lower stem parts and root stalks.

A contract to rear as many Cochylis as possible over the winter was given to Applied Bionomics of British Columbia. Infested plants from Applied Bionomics were sent and placed in the field over or beside established tansy ragwort rosettes. A total of 359 infested plants with approximately 10 larvae per plant were placed in a Sussex pasture on three occasions between May 16 and June 10, 1991. Larvae were later found in established tansy ragwort rosettes indicating successful transfer from the earlier distributed infested plants. By May 31, larvae, pupae and a couple of adult moths were observed. The odd moth was occasionally observed later in the summer. On September 12, 63 tansy ragwort root crowns were sent from Dr. P. Harris (Ag. Can. Regina) and placed on rosettes. Between 1 and 10 larvae were found on the plants sent. Cochylis moths or injury symptoms were not observed around last years release site.

3) Tyria jacobaea (cinnabar moth)
-defoliator

Cinnabar moth was first released in New Brunswick in 1970. It was difficult and slow to establish and survived at low densities for several years, then exploded. The Sussex area has cinnabar moth well established in the majority of its fields. This year three releases were made using the infestation in Sussex as the source.

1) Saint John East (Red Head) - 1000 larvae
July 24,1991

2) Douglastown - 1000 larvae
July 18, 1991

3) Strathadam - 1000 larvae
July 18, 1991

The adult Cinnabar moth was first observed on June 4 this summer and egg masses first observed on June 18. By July 15 Cinnabar moth larvae were observed throughout the entire field in Sussex.

Two of last year's release sites in Saint John were checked this summer for Cinnabar moth establishment. The release site in Red Head had many larvae present but the release site by the Digby boat terminal was apparently unsuccessful as no larvae were observed.

II) Canada Thistle

Canada thistle is a spiny perennial weed that is native to Europe, and found in all provinces and crops. It thrives in fertile, well drained soils, overgrazed pastures and small grain crops. Grazing animals can be scratched by this weed and develop infections. In addition, it makes harvesting difficult and its spines can attach itself to some food crops. Presently it is widespread throughout all New Brunswick, particularly in overgrazed pastures.

A) Releases and Observations:

1) Urophora cardui (stem gall fly)
   -forms galls on main and/or side shoots

In 1990 insects were released at different locations throughout N.B. In the spring of 1991 all sites were found to have a few galls present. There were not a large number of galls found at any one site however.

In 1991, 1200 galls were collected from Sussex. These galls were placed in a screened cage at Fredericton and adult flies emerged in June and July under natural conditions. Any parasites that emerged from the galls were killed. The flies were collected periodically and released at 10 locations after male and female flies were counted (Table 1).

Sites were checked in late summer at which time main stem and side shoot galls were counted. Galls were found at all sites checked. Results indicated that only 27% of the galls were found on main stems, where it is more desirable. Results also indicated that there was a higher incidence of galls when over 200 insects were released at a site (Table 1).

TABLE 1: 1991 Release Sites - Urophora cardui

		Male	Female	Total	Release Date	# Plants Affected	Formed Galls Main Stem	Formed Galls Side Shoot
Douglas	York Co.	70	45	115	June 11	N/A	N/A	N/A
Somerville	Kings Co.	126	108	234	June 12 June 18	79	25	66
Good's Corner	Carleton Co.	62	52	114	June 14	18	9	10
Williamstown	Carleton Co.	62	58	120	June 14	18	11	9
Jacksontown	Carleton Co.	55	45	100	June 19	16	2	17
Upper Queensbury	York Co.	100	90	200	June 20	18	0	21
Bear Island	York Co.	84	99	183	June 21	6	1	7
St. Quentin	Restigouche	70	70	140	June 24	1	0	1
South Nappan	Northumber-land Co.	56	49	105	June 26	2	1	2
Fredericton	York Co.	30	37	60	July 8	N/A	N/A	N/A

2) Ceutorhynchus litura (Stem boring weevil)
- adults feed on spring shoots and larvae mine from the leaf into the stem and root collar

On May 21, 1991, 197 adult weevils were released in a Sussex pasture containing Canada Thistle. By August 22, some mined stems were found. No weevils were observed however.

3) Larinus planus (European Weevil)
-larvae feed on developing thistle flower tissue

On July 5, 1991, 300 Larinus planus adult weevils were released in Sussex at two sites in the same pasture. By July 11, adult feeding damage was observed. By August 2, Larinus planus was found in brown unopened seed heads, at both release sites. It looked to be in a white larval or pupal stage. The release site was near last year's release site so it is difficult to assess if the observed weevils were totally from this year's release.

III) St. John's Wort

St. John's Wort is an introduced perennial that spreads by both seed and rhizome. It is a poisonous plant that causes photosensitization. This results in white patches or light coloured skin which becomes sunburned under normal exposure to light. With as little as 1.0%, St. John's wort in its diet, livestock can be affected. The livestock rarely die but they lose their appetite and condition. Chemical control of this weed is very difficult. In the 1950's, 6,000,000 acres were infested in California and through biological control efforts it is now at 1.0 % of its original density.

A) Releases and Observations:

1) Chrysolina hyperici (beetle)
-feeds on leaves and flowers

Chrysolina was first released just outside Fredericton (North Tay) in 1970. It is now considered well established and has since moved approximately 5 kilometres north of original release site.

On May 14, 1991 Chrysolina beetle larvae were observed in North Tay. Five of six release sites from 1990 were also checked but no larvae were observed at this time. Adult beetles were not observed until June 25 in North Tay and Cambridge Narrows.

Chrysolina beetles were collected from Nova Scotia and from the original release site in North Tay. Beetles were then distributed as follows:

1991 Release Sites:

		TOTALS	DATE
1)	Queensbury	1300	July 4,5
2)	Cambridge Narrows	330	July 5
3)	Ward's Creek	1200	July 5

2) Aphis chloris (aphid)
- root crown feeder

Adults and nymphs were released in North Tay on May 15, 1991 and were slow to move to new St. John's wort plants. On June 3 some adult aphids were found on the foliage but not on the roots as expected. By July 10th there were no signs of Aphis chloris at the release site. The site will be monitored next year to determine their success in overwintering.

3) Anaitis plagiata (moth)
looper-early spring foliage feeder

One hundred pupae were released in 1990 with no further releases in 1991. There were no Anaitis plagiata observed at last years release site when checked this past summer. It is assumed that winter survival was poor.

IV) Perennial Sow Thistle

Perennial sow thistle is an introduced perennial reproducing and spreading by both seed and rhizome. It is considered a serious weed in both cultivated and wasteland, and can be very competitive. Chemical control is costly and not always effective.

A) Releases and Observations:

1) Liriomyza sonchi (leaf miner fly)
- larvae form blotch mines in leaves

At one of the two 1990 release sites in St. Quentin, it appeared that some blotch mines may have been formed when checked in the late summer of 1991. Positive confirmation could not be made at the time however, as we had no experience at what the mines should look like.

All 1991 Liriomyza releases were in the same field in close proximity to each other.

1991 Liriomyza Releases:

May 23	800 pupae	St. Quentin
June 7	468 pupae	St. Quentin
	1268	

There was no confirmation of blotch mines forming on perennial sow thistle, but it is possible that we were looking for the wrong type of mine. We now have leaves with blotch mines present (sent from Dr. Peschken, Regina) that will assist us next spring in determining if the Liriomyza were able to successfully overwinter.

2) Cystiphora sonchi (gall forming midge fly)
- forms numerous small galls on the leaves

Cystiphora sonchi were released on perennial sow thistle for the first time this year. Releases were all made in St. Quentin, Restigouche Co., in the same field where Liriomyza sonchi were released.

1991 _Cystiphora_ _sonchi_ releases:

	Pupae	Larvae	Location
July 4	111	1178	St. Quentin
July 25	98	2402	St. Quentin
August 9	00	800	St. Quentin
	209	4380	

By August 9th galls were observed on leaves from the earlier _Cystiphora_ _sonchi_ releases. On August 28, galls and plants affected were counted. The summary of data (Table 2) indicated that there were 23 perennial sow thistle plants that had galls present. The total number of galls found on these plants was 236. The furthest galls found from the release site were approximately 2.5 m away.

V) **_Linaria_ _vulgaris_** **Toadflax**

Toadflax is a perennial weed originally introduced as an ornamental. It is presently a serious problem in many strawberry fields, orchards, raspberries and in some alfalfa, hay, and grain fields. It is toxic to livestock, but poisoning has not been reported in Canada, as cattle generally avoid grazing within toadflax stands. Cattle have less ability to distinguish and reject toadflax in hay, so it is prudent to avoid feeding hay with a high toadflax content. Toadflax is usually found in uncultivated land and can be very competitive. It is also very difficult to control chemically within a crop.

A) Releases and Observations:

All the insect releases on toadflax were made at the same site in Fredericton.

1) _Calophasia_ _lunula_ (defoliating moth)
-larvae are leaf eating caterpillars

No releases were made in 1991 but a few larvae from 1990 releases were found at their original release site (Fredericton). The site was checked occasionally throughout the summer but larvae were not observed until the toadflax were in flower on August 26th. The site was late flowering as compared to toadflax observed in other areas of the province indicating that they may have been under an earlier stress.

There was also a report of _Calophasia_ being observed outside Saint John (Darling's Island), indicating that this agent must also occur

TABLE 2 Data on progress of Cystiphora sonchi on Perennial Sow Thistle, 1991.

PLANT	# LEAVES/PLANT WITH GALLS	# GALLS/LEAF
1	1	3 galls on 1 leaf
2	1	5 galls on 1 leaf
3	1	1 gall on 1 leaf
4	2	7 galls on 1 leaf; 3 galls on 1 leaf
5	1	4 galls on 1 leaf
6	1	4 galls on 1 leaf
7	1	5 galls on 1 leaf
8	2	3 galls on 1 leaf
9	1	1 gall on 1 leaf
10	2	5 galls on 1 leaf; 2 galls on 1 leaf
11	2	6 galls on 1 leaf; 1 gall on 1 leaf
12	1	6 galls on 1 leaf
13	1	1 gall on 1 leaf
14	1	25 galls on 1 leaf
15	1	21 galls on 1 leaf
16	1	3 galls on 1 leaf
17	1	26 galls on 1 leaf
18	2	10 galls on 1 leaf; 4 galls on 1 leaf
19	1	9 galls on 1 leaf
20	1	18 galls on 1 leaf
21	1	21 galls on 1 leaf
22	2	26 galls on 1 leaf; 10 galls on 1 leaf
23	1	5 galls on 1 leaf

* Data collected on 28 August, 1991

naturally in New Brunswick to some degree, as no previous releases in that area have been reported.

Darling's Island would be over 100 kilometres from the original 1990 release site.

2) Gymnaetron antirrhini (weevil)
- Feeds on shoots and seeds

On August 6, 1991, 169 adult weevils were released in Fredericton at the same site as the 1990 releases. On August 26, weevils were found in high numbers but it is not known if any of these were from the 1990 release. No Gymnaetron from the 1990 release were observed on May 29, July 10 or July 16 when checked for at the site. The toadflax plants at this site were however weak looking and late flowering indicating that plants may have been stressed earlier on, possibly from early spring feeding.

3) Brachypterolus pulicarius beetle
-adults are spring stem feeders and larvae feed on flowers

On August 6, 1991, 410 adult beetles were released for the first time in Fredericton. Observations will be made next year to determine if they can successfully overwinter in this area.

VI) Other work on biological weed control

1) Bedstraw populations were monitored throughout different areas of New Brunswick looking for any native insects or pathogens that may have attacked and affected the spread and distribution of bedstraw. No potential biological control agents were found.

2) A survey on scentless chamomile was conducted throughout New Brunswick to determine if Apion hookeri, a seed eating insect originally from Europe, was established here naturally. Plants were collected from the St. Andrews area; from Sackville to Shediac; from Dalhousie to Shippigan; the Saint John Area; the Moncton area; and the Fredericton area. Seed heads were dissected by Dr. D. Peschken (Ag. Can-Regina). It was determined that Apion hookeri does not occur in New Brunswick and could be a potential candidate for biological control of this weed.

VII) Future objectives:

This is the second year of a four year project being conducted throughout New Brunswick. Release sites will be monitored next year and insect establishment further evaluated. Release sites will be further expanded and previous release sites further built up until populations can survive on their own. At the end of the fourth year, a final report will be prepared on which insects can be considered established and which ones were unsuccessful.

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WEED CONTROL IN SNAP BEANS

K.V. McCully, J. Walsh, M.A. Mann and D.O. Hanscomb

ABSTRACT: A trial to evaluate various herbicides on weed control and crop tolerance in processing beans was conducted. Preplant incorporated, pre-emergence, and post emergence herbicides applied either alone, in a tank mix, or applied sequentially were evaluated. Visual ratings on crop damage and control of individual weed species were collected. In addition yields, and crop maturity ratings were collected and evaluated. Results indicated that some initial crop injury was evident, but as the season progressed damage levels were not significantly different from the control. Analysis of bean maturity data however, indicated that clomazone, dinoseb, and imazethapyr+agral 90+ 10-34-00 delayed crop maturity somewhat. Only the imazethapyr+agral 90+ 10-34-00 treatment resulted in a significant delay however. Most treatments with the exception of trifluralin, fomesafen + agral 90, imazethapyr, imazethapyr+agral 90+ 10-34-00, eptc+trifluralin, and eptc, provided excellent weed control by harvest. Overall the most effective treatment in terms of crop tolerance, weed control, and yields was BAS 35140 + imazethapyr (0.84 + 0.05 kg/ha) followed by metobromuron.

SUPPRESSION DES MAUVAISES HERBES DANS LES CULTURES DE HARICOTS MANGE-TOUT

K.V. McCully, J. Walsh, M.A. Mann et D.O. Hanscomb

RÉSUMÉ : On a effectué des essais afin d'évaluer la tolérance des haricots de transformation et le taux de répression des mauvaises herbes pour divers herbicides. On a évalué l'efficacité d'herbicides incorporés au sol avant la plantation et d'autres appliqués à la prélevée et à la postlevée soit seuls, soit dans un mélange ou en application séquentielle. On a également mesuré les rendements et les degrés de maturation des récoltes. On a constaté après le traitement des dommages évidents aux cultures, mais plus tard dans la saison les résultats concernant les dommages n'étaient pas tellement différents de ceux dans les parcelles non traitées. Toutefois, les données d'analyse du degré de maturation révèlent que le clomazone, le dinosèbe et l'imazethapyr + Agral 90 + 10-34-00 ont retardé la maturation. Seul l'imazethapyr + Agral 90 + 10-34-00 a entraîné d'importants retards dans la maturation. À la récolte, la plupart des traitements avaient supprimé efficacement les mauvaises herbes sauf ceux qui suivent : trifluraline; fomesafen + Agral 90; imazethapyr; imazethapyr + Agral 90 + 10-34-00; eptc + trifluraline; et eptc. Dans l'ensemble, le meilleur traitement en ce qui concerne la tolérance des cultures, la répression des mauvaises herbes et les rendements est le BAS 35140 + imazethapyr (0,84 + 0,05 kg/ha) suivi d'une application de metobromuron.

INTRODUCTION: Processing beans are currently being produced over a number of acres in New Brunswick, and is expected to increase in the upcoming years. In addition there are also a number of acres grown for the fresh market. Previously, dinoseb was the standard recommendation for weed control in beans. However, as of last year dinoseb use within N.B. was prohibited after a banning by the N.B. Dept. of Environment. As a result an effective and consistent herbicide was lost meaning that a replacement had to be found. A trial was therefore established as a continuation of trials conducted the previous two years (see McCully et. al. in 1989 and 1990 Adaptive Research Reports) to evaluate various herbicides for use in snap beans.

MATERIALS AND METHODS: Gold Rush beans were planted June 6, 1991 in a trial at Florenceville, Carleton County. Soil type was a silt loam having a pH of 5.6 and an organic matter content of 3.0%. The seeding rate was 110 seeds/m^2 and row width was 18 cm. 350 kg/ha of 8-16-12 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size 3m x 6m. Previous crop was potato. Preplant incorporated (PPI) and preemergence (PRE) herbicides (Table 1) were applied June 6. The PPI herbicides were incorporated with a roto-tiller to a depth of 7.5 cm. Post-emergence (POST) herbicides (see Table 1) were applied July 7 at the 2-3 trifoliate bean leaf stage and when weeds were approximately 5 cm high. Herbicides were applied using a CO_2 hand held sprayer in a water volume of 200 L/ha. Sprayer pressure was 207 kPa. Rainfall levels were 3 mm, seven days before the PPI and Pre applications and 73 mm and 4 mm seven and fourteen days after. Rainfall levels seven days before POST applications were 10 mm, and 1 mm and 11 mm seven and fourteen days after.

Visual assessments on crop phytotoxicity and individual weed species control were taken July 18 and August 13. Harvest and bean maturity data was collected August 14. Bean maturity involved measuring ten centre seeds from size four beans in millimetres. Analysis of variance was performed on data and arcsin transformations made on visual ratings where necessary. Yield and maturity data were transformed using logs. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

Crop injury: Initial crop injury was observed from most all treatments by July 18 (42 days after ppi and pre applications and 11 days after post) (Table 1). Only six treaments, dinoseb (21.0%), clomazone (21.0%), imazethapyr+agral 90+ 10-34-00 (13.0%), trifluralin; + bentazon + assist (12.0%), BAS 35140 (10.0%), and BAS 35140+imazethapyr(0.6+ 0.05 kg/ha)(10.0%) had injury levels of 10.0% or over. By harvest however, all treatments recovered as only one treatment, fomesafen+agral 90 (5.0%), had any reported injury.

Bean maturity ratings were also collected by measuring the center four beans from size 10 beans at harvest. Results indicated that only three treatments, imazethapyr+agral 90+ 10-34-00 (91), dinoseb (104), and clomazone (105), delayed maturity as compared to the control (107) (see table 1). Only the imazethapyr+agral 90+ 10-34-00 treatment resulted in a significant delay, however. This delay in maturity could be attributed to crop injury and not weed pressure as these treatments had fewer weeds than the untreated control.

Weed control: Weed densities and composition was variable between plots making weed control evaluations difficult. Four of the more prevalent weeds at the trial site, lambs quarters, cudweed, pineappleweed, and barnyard grass will be discussed on a per species basis.

Lamb's quarters: Excellent early season lamb's quarters control resulted from most treatments (Table 1). By July 18 only 5 treatments, fomesafen + agral 90 (65%), imazethapyr+agral 90+ 10-34-00 (61.0%), eptc+trifluralin (50%), eptc (50.0%), and trifluralin (36.0%), resulted in less than 80.0% lamb's quarters control. It was surprising that eptc, trifluralin, and fomesafen+agral 90 provided poor control as they are generally considered effective herbicides for lamb's quarters control. Reasons for their ineffectiveness is not understood. By August 13 these same treatments provided less than 50.0% control (Table 1). All other treatments except dinoseb (68.0%) and clomazone (70.0%) provided at least 85.0% lamb's quarters control. Treatments providing over 90.0% control by August 13 included, monolinuron (98.0%), BAS 35140+imazethapyr (0.6+0.05 kg/ha) (96.0%), metobromuron (95.0%), BAS 35140+imazethapyr (0.84+0.05 kg/ha) (94.0%), trifluralin;bentazon+assist (93.0%), and BAS 35140+fomesafen (90.0%).

Cudweed: The only two treatments which did not provide significant cudweed control as compared to the untreated check by the July 18 assessment date was trifluralin (25.0%) and imazethapyr(pre) (25.0%). The remaining treatments provided between 72.5% and 100.0% control and were not significantly different from one another (Table 1). By August 13 these two treatments, in addition to eptc+trifluralin, imazethapyr+agral 90+10-34-00, and fomesafen+agral 90 were not significantly different from the untreated control. The remaining treatments, although ranging from 58 to 100% control were not significantly different from one another. This was due to the variability of cudweed from the treatments in each replicate. The five treatments resulting in 100.0% cudweed control by August 13 included: clomazone, trifluralin;bentazon+assist, dinoseb, BAS 35140+fomesafen, and BAS 35140.

Pineappleweed: By July 18 all treatments significantly controlled pineappleweed as compared to the untreated control. Only two treatments, trifluralin (38.0%) and imazethapyr(pre) (70.0%) resulted in control under 95.0%. By August 13 all but 5 treatments, imazethapyr(pre) (38.0%), imazethapyr+agral 90+ 10-34-00 (50.0%), eptc+trifluralin (50.0%), trifluralin (50.0%), and eptc (63.0%) provided over 98% control. Based upon these results imazethapyr, trifluralin and eptc should not be recommended for pineappleweed control.

Barnyard grass: By July 18 four treatments, BAS 35140, bentazon+assist, BAS 35140+fomesafen and fomesafen+agral 90 provided control levels not significantly different from the untreated control (Table 1). This could be expected as these herbicides are selective for broadleaf weeds and not annual grasses. The remaining treatments with the exception of imazethapyr (55.0%) provided between 69.0% and 100.0% barnyard grass control. Although this range was wide, none of these treatments were significantly different from one another. This was due to the variability of barnyard grass densities throughout the trial site. This same trend continued through to the August 13 assessment date (Table 1). Treatments resulting in over 90.0% control by August 13 included, eptc (100.0%), clomazone (100.0%), imazethapyr+agral 90+10-34-00 (95.0%), and BAS 35140+imazethapyr (0.84+0.05 kg/ha) (94.0%).

Yields: The only treatment with yields lower than the untreated control was imazethapyr+agral 90+ 10-34-00 (Table 1). Initial injury affected bean production more from this treatment than the others although initial foliar injury did not appear to be high. Weed control was also somewhat poor from this treatment which could have further reduced yields.

Treatments with yields not significantly higher than the untreated control (9.0 t/ha) included dinoseb (10.0 t/ha), imazethapyr (10.4 t/ha), trifluralin+bentazon +assist (10.9 t/ha), monolinuron (12.0 t/ha), and bentazon+assist (12.3 t/ha). The highest yielding treatment was BAS 35140+imazethapyr(0.84+0.05 kg/ha) (16.5 t/ha), followed by metobromuron (15.2 t/ha) and BAS 35140 (14.2 t/ha). The remaining yields ranged from 12.9 to 13.9 t/ha but were not significantly different from the highest yielding treatment.

CONCLUSIONS: Initial foliar injury was observed from most all treatments by July 18, but by harvest(August 13) they had all recovered. Analysis of bean maturity data however indicated that clomazone, dinoseb, and imazethapyr+agral 90+ 10-34-00 all delayed maturity as compared to the control. Bean maturity would have been delayed in the control plots somewhat because of weed competition. It could therefore be assumed that the delay in bean maturity from these three treatments was the result of crop injury, since weed pressure was less in these plots than the untreated control.

Weed competition and density was variable from plot to plot making weed control evaluations difficult. Treatments which provided the poorest overall weed control included trifluralin, fomesafen+agral 90, imazethapyr, imazethapyr+agral 90+ 10-34-00, eptc+trifluralin and eptc. The remaining treatments all provided excellent weed control on the species evaluated.

Overall in terms of crop tolerance, weed control and yields the best treatment was BAS 35140+imazethapyr (0.84+0.05 kg/ha) followed by metobromuron. In trials conducted the past two years metobromuron treated plots have always yielded well and has provided good weed control. Metobromuron (Patoran ™) is presently registered and could be considered an effective alternative to dinoseb.

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Table 1. Yields Maturity Ratings and Visual Ratings on Crop Injury and Weed Control in Snap Beans

TRT	Rate Kg(a.i.) /ha	Timing	% CROP INJURY		% LAMB'S QUARTERS CONTROL		% CUDWEED CONTROL		% PINEAPPLE WEED CONTROL		% BARNYARD GRASS CONTROL		BEAN YIELD T/Ha	BEAN' MATURITY
			July 18	Aug. 3	July 18	Aug. 13	July 18	Aug. 13	July 18	Aug. 13	July 18	Aug. 13	Aug. 13	Aug. 13
Control	-	-	0 g *	0 NS	0 e	0 e	0 b	0 e	0 d	0 c	0 e	0 f	9.0 f	107 ab
EPTC	3.4	ppi	3 efg	0	50 cd	38 d	95 a	58 abcd	100 a	63 ab	100 a	100 a	13.9 abcd	115 ab
Trifluralin	1.1	ppi	5 defg	0	36 d	44 cd	25 b	10 de	38 c	50 b	75 ab	70 abc	12.9 abcde	107 ab
clomazone	0.75	ppi	21 a	0	81 ab	70 abc	100 a	100 a	95 a	100 a	100 a	100 a	13.7 abcd	105 ab
Trifluralin; Bentazon + Assist	1.1; 1.0 + 2 L/ha	ppi; post	12 bc	0	96 a	93 ab	100 c	100 a	100 a	100 a	91 ab	89 ab	10.9 cdef	111 ab
Imazethapyr	0.1	Pre	6.0 def	0	83 ab	85 ab	25 b	40 bcde	70 b	38 bc	55 bcd	50 bcd	10.4 def	107 ab
Imazethapyr + Agral 90 + 10-34-00	0.1 + 0.25% v/v + 2L/ha	post	13.0 b	0	61 bcd	30 d	88 a	28 cde	100	50 b	90 ab	95 a	5.0 g	91 c
Monolinuron	1.25	pre	3.0 efg	0	100 a	98 a	100 a	85 ab	100 a	100 a	87 ab	85 ab	12.0 bcdef	112 ab
Metobromuron	1.0	pre	1.0 fg	0	100 a	95 ab	100 a	93 a	100 a	100 a	69 abc	58 abcd	15.2 ab	115 ab
Dinoseb	3.7	pre	21.0 a	0	83 ab	68 bc	100 a	100 a	100 a	100 a	86 ab	65 abcd	10 ef	104 b
Bentazon + Assist	1.1 + 2L/ha	post	9.0 bcd	0	100 a	86 ab	100 a	94 a	100 a	98 a	13 e	43 cde	12.3 bcdef	107 ab
BAS 35140 + Imazethapyr	0.6 + 0.05	post	10.0 bcd	0	98 a	96 ab	100 c	63 abc	100 a	100 a	94 ab	85 ab	13.0 abcde	107 ab
BAS 35140 + Imazethapyr	0.84 + 0.05	post	5.0 def	0	99 a	94 ab	100 a	83 ab	100 a	100 a	98 a	94 a	16.5 a	113 ab
Fomesafen + Agral 90	0.25 + 0.1 % v/v	post	13 fg	5.0	65 bc	40 d	72.5 a	50 abcde	100 a	100 a	33 cde	28 def	13.7 abcd	100 ab
BAS 35140 + Fomesafen	0.84 + 0.15	post	7.0 cde	0	100 a	90 ab	100 a	100 a	100 a	100 a	20 de	2.5 f	13.0 abcde	113 ab
BAS 35140	0.84	post	10.0 bcd	0	95 a	85 ab	100 a	100 a	100 a	100 a	13 e	7.5 ef	14.2 abc	109 ab
EPTC + Trifluralin	2.36 + 0.56	ppi	3.0 efg	0	50 cd	49 cd	72.5 a	23 cde	100 a	50 b	100 a	75 abc	13.7 abcd	118 a

*Means followed by the same letter are not significantly different at the 0.05 level of significance according to the Duncan's Multiple Range Test. Visual Ratings are expressed as a percentage (0-100%)

BROADLEAF WEED CONTROL IN TURF

K.V. McCully, M.A. Mann, and D.O. Hanscomb

ABSTRACT: A trial to evaluate various herbicides, formulations and rates on turf weed control and injury was conducted. Visual weed control and grass injury was evaluated at 1,2,3,5, and 8 weeks after application. Results indicated that no turf injury was observed from any treatment throughout the assessment period. The best overall treatment for mouse-eared hawkweed and fall dandelion control was 2,4-D/mecoprop/dicamba. The addition of Agral 90 to clopyralid/triclopyr treatments reduced weed control levels as compared to clopyralid/triclopyr (0.72 kg/ha), but not always significantly. The clopyralid 0.72 kg/ha rate (36.0% a.i.) was more effective than the 0.828 kg/ha rate (36.0% a.i.) but differences were not significant. The best two clopyralid/triclopyr treatments in terms of weed control was clopyralid/triclopyr (0.72 kg/ha) and clopyralid/triclopyr applied as a mist.

SUPPRESSION DES COTYLÉDONES DANS LES CULTURES DE GAZON

K.V. McCully, M.A. Mann et D.O. Hanscomb

RÉSUMÉ : On a entrepris d'évaluer l'efficacité de divers herbicides selon différents composés et diverses doses ainsi que la tolérance des cultures de gazon à l'égard de ces herbicides. Des évaluations visuelles des dommages causés au gazon et de la suppression des mauvaises herbes ont été réalisées 1, 2, 3, 5 et 8 semaines après le traitement. On n'a constaté aucun dommage causé par l'un des traitements durant toute la période d'évaluation. Dans l'ensemble, le meilleur traitement pour la suppression de l'épervière piloselle et du liondent automnal était le composé 2,4-D/mécoprop/dicamba. L'ajout du Agral 90 aux mélanges de clopyralide/triclopyr a réduit les taux de répression des mauvaises herbes en comparaison avec le clopyralid/triclopyr (0,72 kg/ha), mais pas toujours de façon marquée. Une dose de 0,72 kg/ha de clopyralide (36 % i.a.) était légèrement plus efficace qu'une dose de 0,828 kg/ha (36 % i.a.). Pour la suppression des mauvaises herbes, les deux meilleurs composés sont le clopyralide/triclopyr (0,72 kg/ha) et le clopyralide/triclopyr projeté en fines gouttelettes.

INTRODUCTION: Within the turf industry there has been a heavy reliance on 2,4-D based products for weed control. With the negative publicity that 2,4-D has received, some controversy has been created with misinformed and sensational claims being created. As a result, some people are reluctant to use 2,4-D although the compound has been thoroughly studied over the years, and conditions for safe use and environmental protection are widely known. The people who perceive 2,4-D as a problem have therefore, created a potential market for a product that can provide as consistent and as effective results. Some companies are therefore evaluating various products as potential replacements for 2,4-D. A trial was therefore established to evaluate various alternatives to 2,4-D based products.

MATERIALS AND METHODS: A trial was established in a mature turf stand in Fredericton, York County. Soil type was a silt loam with a pH of 5.2. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 2 m. Post emergence herbicides (Table 1) were applied to actively growing turf June 17, 1991. Various clopyralid/triclopyr mixtures at various rates were compared with 2,4-D/mecoprop/dicamba (Killex), chlorsulfuron and BAS 51434H + BAS 89024S. Treatment 8 was applied as a mist from a spray bottle containing 1:3 ratio of clopyralid:triclopyr. All other treatments were applied in a water volume of 500 L/ha at a pressure of 207 kPa. Rainfall was 41 mm seven days prior to application, 4 mm seven days after and 7mm fourteen days after.

Visual assessments on crop phytotoxicity and weed control were collected June 24, July 2, July 9, July 23, and August 12.

Analysis of variance was performed on the visual evaluations and means separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

Grass injury: No grass injury was observed from any treatment during the June 24 to August 12 assessment period.

Weed control: There were a number of weeds observed in the trial area, but only hawkweed and fall dandelion had a uniform and consistent coverage. Other weeds present at the trial site included dandelion, plantain, chickweed, daisy, heal-all and oxalis, but densities and coverage were not consistent over the four replicates.

Mouse eared hawkweed: Hawkweed control from the various treatments was relatively consistent throughout the assessment period. Control levels changed very little from the first rating, on June 24, to the last rating on August 12 (Table 1). Throughout the rating period, only two treatments clopyralid/triclopyr (mist) (July 2,9,23) and 2,4-D/mecoprop/dicamba (July 23) provided hawkweed control levels over 70%. Hawkweed control was therefore considered poor by all the treatments evaluated.

By the final August 12 assessment, hawkweed control levels ranged from 10.0% to 67.25%. Treatments with control levels not significant from the untreated control included chlorsulfuron, BAS 51434 H + BAS 89024S, clopyralid/triclopyr + Agral 90 (0.36 kg/ha + 0.25% v/v) and clopyralid/triclopyr + Agral 90 (0.54 kg/ha + 0.25% v/v). The other treatments provided high early season control but hawkweed recovered as the season progressed. The remaining treatments provided control levels from 37.25 to 67.25% and were not significantly different from one another. The two best treatments were 2,4-D/mecoprop/dicamba (67.25%) and clopyralid/triclopyr (mist) (62.5%). There were no significant differences between clopyralid/triclopyr applied at the 0.72 or the 0.828 kg/ha rate (Table 1).

The clopyralid/triclopyr treatment applied at 0.828 kg/ha with the 6.9% EC formulation (53.25%) was more effective than when applied with the 36.0% EC formulation (49.25%). Differences were not significant however.

The surfactant, Agral 90 was added to reduced clopyralid/triclopyr rates (0.36, 0.54 and 0.72 kg/ha) to compare weed control levels attained at the 0.72 and 0.828 kg/ha rates with no Agral 90 added. Results indicated that the addition of Agral 90 did not improve hawkweed control levels. For example, clopyralid/triclopyr applied at 0.72 kg/ha with Agral 90 resulted in hawkweed control of 37.25%, and without Agral 90 ,49.25%. Hawkweed control was reduced to 22.0% at the low 0.54 kg/ha clopyralid/triclopyr + Agral 90 rate, and to 19.75% from the 0.35 kg/ha rate of clopyralid/triclopyr + Agral 90 . Although these lower rates provided less control than the treatments without Agral 90 added differences were not significant when analyzed. Reasons for this was the variability from replicate to replicate for each treatment. For example, control levels over the four replicates for clopyralid/triclopyr + Agral 90 at 0.72 kg/ha was between 15.0 and 68.0%. More work should be conducted evaluating the effect of surfactants on reduced clopyralid/triclopyr rates before making any definite conclusions.

Fall dandelion: The most effective treatment throughout the assessment period for fall dandelion control was 2,4-D/mecoprop/dicamba followed by BAS 51434 H + BAS 89024S + 2,4-D. Final control ratings were 97.5% and 93.75% respectively. This would indicate that the 2,4-D component is responsible for the high levels of fall dandelion control since it was common in both treatments.

But August 12, trial results indicated that the clopyralid/triclopyr treatment applied at 0.828 kg/ha with the 36.0% EC formulation (48.75%) was more effective for controlling fall dandelion than when applied with the 6.9% EC formulation (35.75%). Differences were not significant however. The 0.72 kg/ha rate of clopyralid/triclopyr (71.25%) was more effective than the 0.828 kg/ha rate (48.75%) but differences were not significant.

Treatments not significantly different from the untreated control by the final August 12 assessment date included the three clopyralid/triclopyr + Agral 90 treatments, clopyralid/triclopyr 0.828 kg/ha (6.9% EC), chlorsulfuron and BAS 51434H + BAS 89024S. The remaining treatments provided control levels between 48.75 and 97.5%.

The addition of Agral 90 to clopyralid/triclopyr (0.36, 0.54 and 0.72 kg/ha) treatments, significantly reduced fall dandelion control as compared to clopyralid/triclopyr 0.72 kg/ha applied with no Agral 90. Reason for the Agral 90 reducing weed control at the 0.72 kg/ha rate is not understood and should be further evaluated.

CONCLUSIONS: No grass injury was observed from any treatment throughout the assessment period. Although a number of weeds were found within the trial site only mouse-eared chickweed and fall dandelion were found consistently throughout the plots. The best overall treatment for controlling both hawkweed and fall dandelion was 2,4-D/mecoprop/dicamba. Poor control resulted from BAS 51434H + BAS 89024S and chlorsulfuron on both hawkweed and fall dandelion and would not be recommended for their control at the time they were applied in this trial.

The addition of Agral 90 to 0.36, 0.54 and 0.72 kg/ha rates of clopyralid/triclopyr reduced hawkweed and fall dandelion control as compared to 0.72 kg/ha applied without Agral 90. Differences were not always significant however. It appears that there is no benefit in adding Agral 90 to clopyralid/triclopyr, but more work should be conducted to confirm this.

Clopyralid/triclopyr (0.72 kg/ha) was more effective than the 0.828 kg/ha rates but not always significantly when evaluating hawkweed and fall dandelion control. Although differences existed depending upon the weed, differences were not significant when comparing the clopyralid/triclopyr 0.828 kg/ha 6.9% EC formulation with the 36.0% EC formulation. The best two clopyralid/triclopyr treatments for overall weed control were clopyralid/triclopyr (0.72 kg/ha) and clopyralid/triclopyr applied in mist.

Table 1. Visual Ratings on Weed Control and Turf Injury

TREATMENT	RATE kg(a.i.)/ha	a.i.	% TURF INJURY (0-100%)	% HAWKWEED CONTROL (0-100%)			% FALL DANDELION CONTROL (0-100%)		
			June 24	June 24	July 9	Aug. 12	June 24	July 9	Aug. 12
Control		-	0 ns	0 f *	0 e	0 e	0e	0e	0 d
Clopyralid/Triclopyr	0.72	36%	0	33.75 bcd	40.00 cd	49.25 abc	76.25 abc	80.00 ab	71.25 ab
Clopyralid/Triclopyr	0.828	36%	0	46.25 abc	51.25 bcd	44.00 abc	67.5 abc	78.75 ab	48.75 bc
Clopyralid/Triclopyr + agral 90	0.72 + 0.25% v/v	36% v/v	0	46.25 abc	53.75 abc	37.25 abcd	45.0 bcd	46.25 cd	22.50 cd
Clopyralid/Triclopyr + Agral 90	0.54 + 0.25% v/v	36 % + % v/v	0	41.25 bcd	46.25 bcd	22.00 bcde	40.75 cd	46.25 cd	0 d
Clopyralid/Triclopyr + Agral 90	0.36 + 0.25% v/v	36% + % v/v	0	25 de	32.50 d	19.75 cde	17.50 de	18.75 de	0 d
Clopyralid/Triclopyr	0.828	6.9%	0	42.50 bcd	52.50 bcd	53.25 ab	63.75 abc	68.75 abc	35.75 bcd
Clopyralid/Triclopyr	mist	0.4%	0	62.50 a	72.50 a	62.50 a	66.25 abc	77.50 ab	60.00 abc
2,4-D/ Mecoprop/Dicamba	1.69	30.8%	0	51.25 ab	62.5 ab	67.25 a	95.00 a	97.50 a	97.50 a
Chlorsulfuron	0.022	75%	0	35.00 bcd	40.0 cd	10 de	50.00 bcd	58.25 bc	15.00 cd
Bas 51434H + Bas 89024 S + 2,4-D	0.2 + 1.0 + 1.0	75% + 75% + 47%	0	30.00 cd	32.50 d	39.00 abcd	77.50 ab	92.50 a	93.75 a
Bas 51434H + BAS 89024S	0.2 + 1.0	75% + 75%	0	8.75 ef	10.00 e	10.75 de	18.75 de	22.50 de	24.50 cd

*Means followed by the same letter are not significantly different at the 0.05 level of significance according to the Duncan's Multiple Range Test.

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